DFAS Commercial Pay Improper Payment Review FY 2014 Sampling Methodology

Purpose

This sampling plan describes the sampling methodology for the Defense Finance & Accounting Service (DFAS) Commercial Pay program to estimate improper payments. This sampling and estimation plan will produce statistically valid improper payment estimates and confidence interval around the estimate. The estimates will be reported in the Department's annual Agency Financial Report (AFR).

This plan is designed in accordance with the *Improper Payments Elimination and Recovery Improvement Act of 2012 (IPERIA; Pub. L. No. 112-248)* and the guidelines of *OMB Circular A-123, Appendix C, Part I (A).*

This plan also considers recommendations from the DoD Inspector General (DoDIG) and Government Accountability Office (GAO). For this plan, an Improper Payment (IP) is defined by OMB guidelines as any payment that should not have been made or that was made in an incorrect amount under statutory, contractual, administrative, or other legally applicable requirements.

Background

DFAS first reported a statistical estimate of improper payments for the Commercial Pay program in the FY12 AFR. The sample size calculation was an attribute design stratified by the DFAS site and entitlement system. Subsequent audits recommend more complex sampling methodology to consider wide-ranging dollar amounts. This plan is a variable design stratified by dollar amount.

The DFAS, Operations, Enterprise Solutions & Standards (ESS), Compliance, Postpay Review & Analysis (PR&A) directorate located in Indianapolis, IN, serves as the DFAS office of primary responsibility for agency reporting and compliance with IPERIA and the OMB guidance.

Internal guidelines for the performance of commercial pay postpay reviews and determination of IP amount (i.e., the paid invoice over or under payment amount) are contained in the Standard Operating Procedures (SOP) developed by ESS, Accounts Payable (AP) Mission Area and PR&A, and distributed to each applicable site. The SOP is updated annually at a minimum.

DFAS will use the sampling results to modify its prevention tools and continue focusing on prevention of improper payments through its prepayment activities (i.e., Business Activity Monitoring (BAM), Pre-validation, Certifying Officer Legislation (COL), Front End Analysis, and Charleston Query).

There will be two-phase procedures for improving accuracy and precision of our FY14 improper payment (IP) estimation. The first procedure is the usage of variable sampling design driven by dollar stratum as in the later equations (1) to (5). The second procedure is keeping the original method of attribute sampling design that is stratified by site/system, as in equations (6) to (8), after the sample size calculation driven by dollar.

Population and Sample Frame

A risk assessment¹ was conducted on the entitlement systems and identified seven entitlement systems at risk for improper payments based on historical postpay review results, historical self-identified results, and volume of outlays.

The seven entitlement systems identified are the Computerized Accounts Payable System for Windows (CAPS), Defense Agencies Initiative (DAI), Enterprise Business System (EBS), General Funds Enterprise Business System (GFEBS), Integrated Accounts Payable System (IAPS), Mechanization of Contract Administrative Services (MOCAS), and One Pay (ONEPAY). Specifically, based on the assessment, MOCAS, DAI, and GFEBS are subject to review based on identified improper payments; while CAPS, EBS, IAPS, and ONEPAY are subject to review for outlay volume. These seven systems cover the majority of the Commercial Pay program outlays.

From the remainder of this document, the definition of population refers to the sample frame described as the seven entitlement system of quarterly data.

The population will be broken down into quarterly extracts and will be on a quarter lag from the true fiscal year in order to implement the reviews, calculate the estimates, and report in the AFR. Table 1 through Table 4 in Appendix 1 show the quarterly population from the seven entitlement systems broken into the dollar strata. The remaining quarterly extracts will follow the structure described and will be included by the end of the FY.

<u>Sample Design</u>

The sampling plan is a stratified simple random sample, variable design, by dollar categories or dollar strata, and using Neyman Allocation (1934) method for appropriate allocation of sample sizes for each dollar strata. For such stratified random sampling, Cochran (1977) noted that the estimated variability of the sample weighted mean payment amount is minimized for a fixed total size of sample *n*, if Neyman Allocation (*n*_h) is used for each stratum size. In simplified words, stratifying by payment size into dollar categories (with Neyman allocation method), reduces the payment amount (\$*x*) variability the most, compared with any other allocation methods. The dollar strata are determined by grouping together those alike items into same categories and not alike items into the next alike categories, iteratively until the Population Count (N), Sample Size (*n*), Stratum Sample Size (*n*_h), Population standard deviation in each stratum (σ_h), and Number of Strata, no longer improve significantly (i.e., little is gained from having

¹ DFAS FY 2014 Risk Assessment for Improper Payment Reporting.

more strata, separating or minimizing N, σ_h , etc.) Note that Strata (-1) and Strata 12 are set to be *certainty strata*.

This plan is designed to estimate the improper dollar amount, as well as provide estimates of over and under payment dollars for use in annual IPERIA reporting in compliance with the OMB Guidance. The plan will also adhere to recommendations by the DoD Inspector General (DoDIG) and GAO.

The sampling plan presented defines the populations of wide-range dollar payment amount from which the quarterly samples are randomly selected and reviewed. The sampling plan (95%, $\pm 2.5\%$) exceeds OMB's statistical probability and precision standards (90%, \pm 2.5%), as suggested in OMB Circular A-123, Appendix C.

The sampling unit will be defined as a paid invoice in which the dollar amount is considered.

Sample Size Calculation

For a stratified random sampling from a reasonably large population stratum size (N_h) , Levy and Lemeshow (1999) provide that the number of sample units (n) needed to be $100 \times (1-\alpha)\%$ certain of obtaining an estimated sample mean (\bar{x}) that differs from the true population mean (\overline{X}) by no more than 100× ε % is as follows.

$$n \approx \frac{\left(\frac{z_{1-(\alpha/2)}^{2}}{N^{2}}\right)\left(\sum_{h=1}^{H}\frac{N_{h}^{2}}{\pi_{h}}\frac{\sigma_{h}^{2}}{\overline{X}^{2}}\right)}{\varepsilon^{2} + \left(\frac{z_{1-(\alpha/2)}^{2}}{N^{2}}\right)\left(\sum_{h=1}^{H}\frac{N_{h}\sigma_{h}^{2}}{\overline{X}^{2}}\right)}$$
(1)

where,

$$\pi_h = \frac{n_h}{n} = \frac{N_h \sigma_h}{\sum_{h=1}^H N_h \sigma_h}.$$
(2)

Cochran (1977) and Levy & Lemeshow (1999) noted that the strata sample size allocation (n_h) in equation (2) is the Neyman Allocation (1934).

Here, H = number of strata

N = total population size of paid invoice

n = sample size of paid invoice

 N_h = the h^{th} stratum population size n_h = the h^{th} stratum sample size, in particular, using the above Neyman Allocation.

 π_h = the ratio of stratum size to the sample size

 σ_h = standard deviation of the h^{th} stratum \overline{X} = the population average dollar of paid invoice $z_{1-(\alpha/2)}$ = the standard Normal (0,1) cut-off point α = Type-I (i.e., false positive) error rate (here, α = 5%) 100×(1- α)% = sampling confidence level (here, 95%) ε = the regulatory (most bearable) threshold of error rate (here, ε = 2.5%).

Sample Selection

The statistical software, SPSS, was used to select the sample of n = 422 invoices for the first quarter (FY13Q4); n = 302 invoices for the second quarter (FY14Q1); n = 374 invoices for the third quarter (FY14Q2); and also n = 454 for the final quarter (FY14Q3) (see Appendix 2, Table 1 to 4). The SPSS Complex Samples module was used to select simple random samples from each stratum as designated (see Appendix 2). Invoices were selected with equal probability within each stratum, and a random seed was used for selection.

Treatment of Missing Payments

Based on our Inclusion/Exclusion criteria of sampling from the population (i.e., the seven entitlement systems), there will likely be no missing payment scenario for calculating the quarterly (essentially annual) point and interval estimation of dollar amount. ESS/PR&A will determine the best approach to any other unexpected scenario that occur later, and will update this sampling plan accordingly.

Completing the Target Sample

It is imperative that sites complete the target quarterly/yearly sample for each dollar strata, as assigned, even if this means allotting additional, yet reasonable, time for completion of a system's quarterly/yearly sample. For reporting purposes, any given system quarterly sample that is not complete by the given report cutoff date due to missing documentation (i.e., documentation requested from but not yet received from a Service) will be treated as an overpayment per IPERIA for that quarter's report. When subsequently reviewed, these overpayments will be reconciled with actual review results. This action will seek to prevent any known biased population estimates due to sampling methods.

Improper Payments Identified

The procedures for notification of improper payments identified in the review are stated in the comprehensive SOP. The procedures identify the documents, and source of such documents, required to perform the review and required documents and reporting criteria to support the identification of an improper payment.

Improper Payment Estimation

For each quarter of the year (or annually), the *n* samples from equation (1) are drawn with n_h allocation for each h^{th} dollar strata to estimate the dollar value of improper payments and to estimate the percentage of paid invoices in error.

Cochran (1977) provides the ratio estimate of program improper payment as

$$\hat{Y} = \sum_{h=1}^{H} \frac{\sum_{i=1}^{n_h} y_{hi}}{\sum_{i=1}^{n_h} x_{hi}} X_h = \sum_{h=1}^{H} \frac{\overline{y}_h}{\overline{x}_h} X_h$$
(3)

where $X_h = \text{total payment amount for stratum } h$

 $x_{hi} = i^{\text{th}}$ sample payment amount for stratum h

 $y_{hi} = i^{\text{th}}$ sample payment improper amount for stratum *h*, and

$$\hat{R}_{h} = \frac{\sum_{i=1}^{n} y_{hi}}{\sum_{i=1}^{n_{h}} x_{hi}} = \frac{\overline{y}_{h}}{\overline{x}_{h}} = \text{ratio of the average improper payment to the average payment}$$

amount in stratum *h*.

The improper payment estimates are calculated as the gross total of both under and over payment estimates. The program improper payment rate is the estimated improper payment total (\hat{Y}) divided by the total universe of payments (X).

From a sample, Cochran (1977) estimated the variance for the corresponding program improper payment estimate as

$$\hat{V}(\hat{Y}) = \sum_{h=1}^{H} \frac{N_h (N_h - n_h)}{n_h (n_h - 1)} \sum_{i=1}^{n_h} \left(y_{hi} - \frac{\overline{y}_h}{\overline{x}_h} x_{hi} \right)^2$$
(4)

where H = number of strata

 N_h = total population of stratum h

 n_h = sample size of stratum h

 \overline{x}_h = sample average payment amount for stratum *h*

 $x_{hi} = i^{\text{th}}$ sample payment amount for stratum h

 \overline{y}_h = sample average payment improper payment amount for stratum *h*

 $y_{hi} = i^{\text{th}}$ sample payment improper amount for stratum *h*.

Then, the $100(1-\alpha)\%$ confidence interval is

$$\hat{Y} \pm z_{\alpha/2} \sqrt{\hat{V}(\hat{Y})}.$$
(5)

Next, Lohr (2010) and Levy & Lemeshow (1999) estimated the paid invoice error rates as

$$\hat{p} = \sum_{h=1}^{H} \frac{N_h}{N} \hat{p}_h,\tag{6}$$

$$SE(\hat{p}) = \sqrt{\sum_{h=1}^{H} \left(1 - \frac{n_h}{N_h}\right) \left(\frac{N_h}{N}\right)^2 \frac{\hat{p}_h(1 - \hat{p}_h)}{n_h - 1}},$$
(7)

where H = number of strata

N = total population of paid invoices $N_h =$ total population of stratum "h" $n_h =$ sample size of stratum "h" $\hat{p}_h =$ error rate of stratum "h".

Then, the approximate $100(1-\alpha)\%$ confidence interval is

$$\hat{p} \pm z_{\alpha/2} SE(\hat{p}). \tag{8}$$

Statistical projections will be made quarterly/annually.

Summary Reports

The DFAS sites with corresponding randomly selected invoices from each dollar categories will report quarterly/annual results of their IPERIA postpay review to ESS/PR&A, following guidelines provided in the SOP or supplemental instructions. Periodic reports will be produced by PR&A and available for system managers and interested senior officials on results of the random reviews.

Annual reports in support of the IPERIA requirements are provided to Office of the Under Secretary of Defense (Comptroller) (OUSD(C)) for use in the Department's Annual Financial Report (AFR). The annual IPERIA report consists of the annual population outlays, estimated dollar value of overpayments, estimated dollar value of underpayments, the sum total of over and underpayment dollars (improper payments total estimated dollars), and the percentage of improper payments to total outlays. The report also includes the causes of the improper payments identified, actions planned or taken to

correct the causes, completion date of the actions, amount of improper payments recovered, internal controls and infrastructure in place to reduce improper payments, and steps the agency has taken to ensure management accountability.

References for Statistical Sampling Methodology and IPERIA Guidance

- Cochran, William G, Sampling Techniques (3rd Ed.), New York: John Wiley & Sons, 1977.
- Levy, Paul S and Lemeshow, Stanley, Sampling of Populations Methods and Applications (3rd Ed.), New York: John Wiley & Sons, 1999.
- Lohr, Sharon L, Sampling Design and Analysis (2nd Ed.), Boston: Brooks/Cole Cengage Learning, 2010.
- Neyman, Jerzy (1934), "On the Two Different Aspects of the Representative Method: The Method of Stratified Sampling and the Method of Purposive Selection," Journal of the Royal Statistical Society, Vol. 97, No. 4, pp. 558-625.
- Office of Management and Budget (OMB) Memo M-11-16, "Issuance of Revised Parts I and II to Appendix C of OMB Circular A-123, of April 14, 2011.

Certification

The sampling and estimation methodology described will produce a statistically valid estimate as required by IPERIA and specified in the OMB draft guidance, OMB Circular A-123 Appendix C, and is statistically sound.



<u>Appendix 1 – Dollar Stratification for Sample Frame</u>

		Population	
Strata	Strata Break	Count (N)	Population Dollar (\$X)
-1	<\$0	2	-\$840.64
0	=\$0	3,662	\$0.00
1	\$0 to \$2,500	774,432	\$389,272,010.82
2	\$2,500 to \$25K	301,533	\$2,794,303,122.76
3	\$25K to \$100K	113,963	\$5,785,334,259.20
4	\$100K to \$200K	34,632	\$4,882,090,801.56
5	\$200K to \$500K	26,649	\$8,300,412,325.07
6	\$500K to \$1M	10,938	\$7,635,609,909.50
7	\$1M to \$3M	7,602	\$12,532,592,931.10
8	\$3M to \$7M	1,982	\$8,674,800,851.90
9	\$7M to \$15M	826	\$8,370,021,617.01
10	\$15M to \$50M	379	\$9,165,120,288.98
11	\$50M to \$100M	78	\$5,550,245,626.26
12	>\$100M	35	\$6,188,009,258.69
Total		1,276,713	\$80,267,812,162.21

 Table 1: Q4FY13 Dollar Stratification for Sample Frame

Table 2: Q1FY14 Dollar Stratification for Sample Frame

		Population	
Strata	Strata Break	Count (N)	Population Dollar (\$X)
1	\$0 to \$2,500	854,021	\$349,804,180.65
2	\$2,500 to \$25K	262,164	\$2,469,745,803.88
3	\$25K to \$100K	104,702	\$5,342,309,790.81
4	\$100K to \$200K	32,731	\$4,614,388,639.83
5	\$200K to \$500K	25,277	\$7,861,153,722.01
6	\$500K to \$1M	10,594	\$7,448,388,693.81
7	\$1M to \$3M	7,269	\$11,987,713,410.55
8	\$3M to \$7M	2,007	\$9,030,806,705.22
9	\$7M to \$15M	813	\$8,291,919,491.08
10	\$15M to \$50M	398	\$10,016,766,169.58
11	\$50M to \$100M	89	\$6,250,312,628.82
12	>\$100M	38	\$7,274,449,471.42
Total		1,300,103	\$80,937,758,707.66

Strata	Strata Break	Population Count (N)	Population Dollar (\$X)
1	\$0 to \$2,500	832,148	\$349,738,284.50
2	\$2,500 to \$25K	265,506	\$2,492,003,138.09
3	\$25K to \$100K	107,495	\$5,483,983,731.01
4	\$100K to \$200K	33,157	\$4,675,338,516.51
5	\$200K to \$500K	25,180	\$7,838,320,253.77
6	\$500K to \$1M	10,388	\$7,312,733,096.43
7	\$1M to \$3M	6,709	\$11,086,674,583.74
8	\$3M to \$7M	1,857	\$8,309,154,052.37
9	\$7M to \$15M	701	\$7,158,891,374.73
10	\$15M to \$50M	354	\$9,250,093,632.11
11	\$50M to \$100M	55	\$3,928,530,226.35
12	>\$100M	24	\$4,765,627,995.38
Total		1,283,574	\$72,651,088,884.99

 Table 3: Q2FY14 Dollar Stratification for Sample Frame

 Table 4: Q3FY14 Dollar Stratification for Sample Frame

		Population	
Strata	Strata Break	Count (N)	Population Dollar (\$X)
1	\$0 to \$2,500	1,075,055	\$416,889,265.01
2	\$2,500 to \$25K	289,352	\$2,673,526,468.63
3	\$25K to \$100K	108,263	\$5,508,869,575.38
4	\$100K to \$200K	32,959	\$4,649,784,852.18
5	\$200K to \$500K	25,276	\$7,895,159,587.90
6	\$500K to \$1M	10,309	\$7,221,855,934.28
7	\$1M to \$3M	6,773	\$11,204,446,914.16
8	\$3M to \$7M	1,908	\$8,471,601,416.41
9	\$7M to \$15M	750	\$7,532,804,930.09
10	\$15M to \$50M	330	\$8,222,296,632.48
11	\$50M to \$100M	63	\$4,317,049,787.11
12	>\$100M	29	\$4,321,556,561.68
Total		1,551,067	\$72,435,841,925.31

Table 1: Q4FY13 Sample Size & Sample Dollar for each stratum				
		Sample		
Strata	Strata Break	Size (n)	Sample Dollar (\$x)	
-1	<\$0	2	-\$840.64	
0	=\$0	0	\$0.00	
1	\$0 to \$2,500	10	\$4,459.05	
2	\$2,500 to \$25K	30	\$322,604.19	
3	\$25K to \$100K	40	\$2,242,689.74	
4	\$100K to \$200K	20	\$2,606,747.51	
5	\$200K to \$500K	40	\$11,783,206.12	
6	\$500K to \$1M	30	\$21,429,292.12	
7	\$1M to \$3M	70	\$122,019,324.91	
8	\$3M to \$7M	40	\$185,460,134.44	
9	\$7M to \$15M	30	\$292,728,793.98	
10	\$15M to \$50M	55	\$1,309,973,186.70	
11	\$50M to \$100M	20	\$1,475,306,732.82	
12	>\$100M	35	\$6,188,009,258.69	
Total		422	\$9,611,885,589.63	

Appendix 2 – Sample Size & Sample Dollar by Stratum

Table 2: O1FY14 Sam	ple Size & Sam	ple Dollar for eacl	h stratum
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		Sample	
Strata	Strata Break	Size (n)	Sample Dollar (\$x)
1	\$0 to \$2,500	10	\$3,685.40
2	\$2,500 to \$25K	20	\$185,969.47
3	\$25K to \$100K	25	\$1,102,216.44
4	\$100K to \$200K	10	\$1,316,252.19
5	\$200K to \$500K	25	\$7,977,982.88
6	\$500K to \$1M	20	\$14,310,601.50
7	\$1M to \$3M	40	\$68,621,249.78
8	\$3M to \$7M	25	\$114,377,533.81
9	\$7M to \$15M	20	\$230,468,472.05
10	\$15M to \$50M	39	\$1,045,566,455.65
11	\$50M to \$100M	30	\$2,135,875,889.90
12	>\$100M	38	\$7,274,449,471.42
Total		302	\$10,894,255,780.49

		Sample	
Strata	Strata Break	Size (n)	Sample Dollar (\$x)
1	\$0 to \$2,500	10	\$2,845.57
2	\$2,500 to \$25K	30	\$236,092.65
3	\$25K to \$100K	35	\$1,817,685.94
4	\$100K to \$200K	15	\$2,074,098.62
5	\$200K to \$500K	35	\$10,549,599.96
6	\$500K to \$1M	25	\$18,026,326.58
7	\$1M to \$3M	60	\$101,331,087.91
8	\$3M to \$7M	35	\$153,858,733.40
9	\$7M to \$15M	26	\$265,817,579.80
10	\$15M to \$50M	50	\$1,143,032,930.21
11	\$50M to \$100M	15	\$934,800,651.88
12	>\$100M	24	\$4,187,999,325.38
Total		360	\$6,819,546,957.90

 Table 3: Q2FY14 Sample Size & Sample Dollar for each stratum

 Table 4: Q3FY14 Sample Size & Sample Dollar for each stratum

		Sample	
Strata	Strata Break	Size (n)	Sample Dollar (\$x)
1	\$0 to \$2,500	15	\$8,660.81
2	\$2,500 to \$25K	35	\$317,095.39
3	\$25K to \$100K	45	\$2,290,126.75
4	\$100K to \$200K	20	\$2,786,488.89
5	\$200K to \$500K	45	\$14,951,577.38
6	\$500K to \$1M	30	\$21,010,885.93
7	\$1M to \$3M	75	\$132,720,105.12
8	\$3M to \$7M	45	\$204,259,514.90
9	\$7M to \$15M	35	\$399,508,004.17
10	\$15M to \$50M	60	\$1,498,020,006.88
11	\$50M to \$100M	20	\$1,296,203,131.97
12	>\$100M	29	\$4,321,556,561.68
Total		454	\$7,893,632,159.87