The RANDOMRHS test set 2013 is a collection of 58 randomly generated instances of two-stage stochastic programs with pure integer variables in both stages, random right-hand sides, and nonnegative problem data. That is, they are multidimensional knapsack problems with random budgets. The problem formulation as well as the random instance generation scheme are discussed in Trapp et al. (2013).

Data:
The RANDOMRHS data contains a zip file for each of 58 test instance classes. For each of the 16 IC-T**X** classes, there are 3 instances in SMPS format, and for each of the 10 IC-K**X** classes, there is a single instance in SMPS format. Thus there are 26 instance classes, and 58 instances. The following table presents the characteristics of these 26 instance classes. Denote $|\Omega|$ as the number of scenarios, m as the number of (combined) first- and second-stage constraints, and n_1, n_2 as the number of first-stage and second-stage integer variables, respectively. Δ refers to the density of technology matrix T and recourse matrix W, "Rows" and "Cols" refer to the number of rows and columns in the extensive form. $|\mathbf{B}^1|$ and $|\mathbf{B}^2|$ refer to the search space size, which is itself a function of m and right-hand side magnitudes.

						Extensive Form		Search Space Size	
	$\|\mathbf{\Omega}\|$	**m**	$\mathbf{n_1}$	$\mathbf{n_2}$	$\mathbf{\Delta}$	**Rows**	**Cols**	$\|\mathbf{B}^1\|$	$\|\mathbf{B}^2\|$
IC-T1	1,000	20	50	50	0.3	2.0E4	5.0E4	3.7E15	6.7E20
IC-T2	1,000	20	50	50	0.4	2.0E4	5.0E4	3.7E15	6.7E20
IC-T3	1,000	20	50	50	0.5	2.0E4	5.0E4	3.7E15	6.7E20
IC-T4	5,000	50	100	100	0.3	2.5E5	5.0E5	8.1E38	1.2E52
IC-T5	5,000	50	100	100	0.4	2.5E5	5.0E5	8.1E38	1.2E52
IC-T6	5,000	50	100	100	0.5	2.5E5	5.0E5	8.1E38	1.2E52
IC-T7	8,000	100	200	200	0.3	8.0E5	1.6E6	6.5E77	1.4E104
IC-T8	8,000	100	200	200	0.4	8.0E5	1.6E6	6.5E77	1.4E104
IC-T9	8,000	100	200	200	0.5	8.0E5	1.6E6	6.5E77	1.4E104
IC-T10	10,000	100	300	300	0.3	1.0E6	3.0E6	6.5E77	1.4E104
IC-T11	10,000	100	300	300	0.4	1.0E6	3.0E6	6.5E77	1.4E104
IC-T12	10,000	100	300	300	0.5	1.0E6	3.0E6	6.5E77	1.4E104
IC-T13	10,000	20	50	50	0.5	2.0E5	5.0E5	3.7E15	6.7E20
IC-T14	50,000	50	100	100	0.4	2.5E6	5.0E6	8.1E38	1.2E52
IC-T15	80,000	100	200	200	0.3	8.0E6	1.6E7	6.5E77	1.4E104
IC-T16	300,000	250	1000	500	0.3	7.5E7	1.5E8	3.4E194	2.2E260
IC-K1	7,812	6	1000	100	0.5	4.7E4	7.8E5	4.7E4	1.0E6
IC-K2	7,812	6	500	500	0.5	4.7E4	3.9E6	4.7E4	1.0E6
IC-K3	7,812	6	300	500	0.5	4.7E4	3.9E6	4.7E4	1.0E6
IC-K4	7,812	6	500	500	0.5	4.7E4	3.9E6	4.7E4	1.0E6
IC-K5	7,812	6	500	500	0.5	4.7E4	3.9E6	4.7E4	1.0E6
IC-K6	7,812	6	500	500	0.8	4.7E4	3.9E6	4.7E4	1.0E6
IC-K7	7,812	7	1000	500	0.7	5.5E4	3.9E6	2.8E5	1.9E7
IC-K8	7,812	7	500	500	0.7	5.5E4	3.9E6	2.8E5	1.9E7
IC-K9	7,812	7	300	500	0.7	5.5E4	3.9E6	2.8E5	1.9E7
IC-K10	7,812	7	1000	500	0.3	5.5E4	3.9E6	2.8E5	1.9E7

Solution:

The following table presents the overall optimal objective values of 56 of the 58 instances, where two of the test instances (IC-K2 and IC-K10) were not solved within the threshold of 200 hours. It also presents the CPU times using the global branch-and-bound algorithm combined with the *First-Stage Exterior Bounding* approach (Variant E1), as presented in Trapp et al. (2013). The instances were compiled using Microsoft Visual Studio 2005 on a PC equipped with Windows XP, a dual-core Intel 3GHz processor, 3GB of RAM, and IBM ILOG CPLEX 11.0.

Test Instance	Obj	CPU Time (s.)	Test Instance	Obj	CPU Time (s.)
IC-T1-1	42.5979	119,118.0	IC-T10-2	12.5578	79,641.1
IC-T1-2	58.8979	154,371.0	IC-T10-3	11.4349	51,218.4
IC-T1-3	36.5027	18,768.7	IC-T11-1	11.0000	4,517.2
IC-T2-1	22.5313	821.5	IC-T11-2	10.0005	2,989.3
IC-T2-2	21.9742	723.2	IC-T11-3	10.0000	4,084.2
IC-T2-3	22.7124	1,102.7	IC-T12-1	6.0000	2,335.4
IC-T3-1	12.9856	68.1	IC-T12-2	6.0129	2,426.1
IC-T3-2	13.4385	83.7	IC-T12-3	7.0000	2,312.6
IC-T3-3	14.9139	113.6	IC-T13-1	15.9902	1,227.5
IC-T4-1	24.5262	19,901.2	IC-T13-2	16.3746	765.3
IC-T4-2	20.5196	23,004.7	IC-T13-3	15.5797	1,108.1
IC-T4-3	25.0739	58,118.7	IC-T14-1	14.0000	7,641.0
IC-T5-1	14.0000	1,147.9	IC-T14-2	11.4615	7,525.2
IC-T5-2	14.0689	1,088.9	IC-T14-3	17.0047	12,280.3
IC-T5-3	12.0080	662.8	IC-T15-1	16.0011	96,552.6
IC-T6-1	10.4273	196.3	IC-T15-2	14.2949	93,082.6
IC-T6-2	10.5991	283.8	IC-T15-3	14.0049	103,870.0
IC-T6-3	10.3598	279.0	IC-T16-1	7.4796	549,179.0
IC-T7-1	11.4057	8,225.8	IC-T16-2	7.0000	533,165.0
IC-T7-2	12.0000	8,674.5	IC-T16-3	7.0308	555,403.0
IC-T7-3	11.3325	7,007.7	IC-K1	86.9666	13,563.8
IC-T8-1	6.9461	1,389.2	IC-K3	81.1436	43,031.8
IC-T8-2	7.0039	1,333.5	IC-K4	195.7830	24,280.5
IC-T8-3	8.0000	1,136.4	IC-K5	93.5154	188,537.0
IC-T9-1	5.0001	851.2	IC-K6	26.3009	13,993.1
IC-T9-2	5.0001	874.4	IC-K7	42.4066	174,291.0
IC-T9-3	6.0001	839.5	IC-K8	49.7239	208,254.0
IC-T10-1	12.7890	107,086.0	IC-K9	29.3508	44,349.8

Updates:

We regrettably note the following two items:

1. Given the large number of scenarios considered, it turned out that there were a small number of occurrences where scenarios were not unique.
2. In a few instances, there were also some scenarios with probability 0.000000 (due to limitations in data precision); this did not pose a computational problem, however, as in such cases the probability-weighted second-stage objective was simply multiplied by zero.

May 12, 2015

Reference:

A. C. Trapp, O. A. Prokopyev, A. J. Schaefer, "On A Level-Set Characterization of the Value Function of an Integer Program and Its Application to Stochastic Programming," *Operations Research*, 61 (2), pp. 498–511, 2013.