

## Summary of variance estimates for PPI price changes, 2017

### Final Demand-Intermediate Demand System

*Final demand:* The 1-month median absolute percent change for the final demand index in 2017 was 0.21 percent, and the accompanying standard error (SE) was 0.11 percent. (See table A, and table 1 of the 2017 PPI variance data release.) Margins of error are usually expressed as plus and minus two standard errors to provide a 95-percent confidence interval with regard to the true change in a reference statistic. Subtracting two SE values from the 1-month absolute median percent change for the final demand index in 2017 includes zero. Therefore, in a typical 1-month period in 2017, the PPI's final demand index did not significantly change from the prior month. The *relative standard error* (RSE) values for the major components of the final demand index varied in 2017.<sup>1</sup> On a 1-month basis, the confidence interval for the goods component of final demand was somewhat narrower than the services and construction components, based on calculations of RSE. The 12-month data for the final demand index in 2017 indicates that the median absolute percent change was 2.37 percent, and the SE was 0.25 percent. Based on RSE measures for 12-month estimates, the 95-percent confidence interval again was narrower for the final demand goods index than it was for the services and construction indexes; however, each component posted a substantially smaller RSE for its 12-month estimate, compared to its 1-month result.

*Intermediate demand by commodity type:* The 1-month median absolute percent change in the index for processed goods for intermediate demand was 0.35 percent in 2017, and the SE value was 0.13 percent. On a 12-month basis, the corresponding values were 4.69 percent and 0.35 percent. Comparing RSE values for the 1- and 12-month calculations within processed goods for intermediate demand, estimates for the processed foods and feeds index were somewhat larger than those for the energy and core components. Relating to the index for unprocessed goods for intermediate demand, reference statistics and SE values for both the 1-month and 12-month analyses were generally larger in absolute terms, compared with the index for processed goods for intermediate demand; however, the RSE estimates were, for the most part, slightly smaller. Within the services for intermediate demand category, results aligned with those for final demand services. First, the 12-month SE values revealed narrower confidence intervals, on an RSE basis, than did the 1-month values. In addition, the component indexes for transportation and warehousing services and for services other than trade, transportation, and warehousing exhibited smaller RSE values than the trade services component. Lastly, the RSE values for intermediate demand services were somewhat larger than those calculated for processed goods for intermediate demand and unprocessed goods for intermediate demand.

*Intermediate demand by production flow:* The production flow treatment of intermediate demand organizes business-to-business type transactions, excluding transactions relating to capital investment purchases, by production stage, as opposed to type of commodity. The same basket of transactions is used to calculate both treatments of intermediate demand, though weighting differences exist between the two treatments. In 2017, the SE values calculated for the production-flow system closely paralleled those calculated for the commodity-type system. First, the goods

indexes posted relatively narrower 95-percent confidence intervals (i.e., smaller RSE values) than did the services and construction components of intermediate demand by production flow. Second, the RSE measures were generally smaller for 12-month changes compared to the 1-month percent change values.<sup>2</sup>

### **PPI Commodity-Based Index Structure**

The unique-to-PPI, commodity-based index structure comprises the detailed components used to construct the FD-ID aggregation system. Data users commonly use PPI commodity indexes to explain FD-ID index movements and as a measure of price changes for commodities regardless of the industry classification of the producing establishment. Variance data are provided for 2-, 3-, 4-, and 6-digit commodity-based indexes. On a 1-month basis in 2017, about 19 percent of PPI commodity indexes for which SE values were available, 196 of 1,030, posted RSE values of under 50. (See table B, and table 2 of the 2017 PPI variance data release.) Roughly 38.6 percent had RSE values between 50 and 100, while 42.3 percent had RSE values of 100 or more. On a 12-month basis, 644 of 1,502 PPI commodity indexes, 42.9 percent, posted RSE values of under 50. About 29.7 percent of the indexes had RSE values between 50 and 100, and 27.4 percent had RSE values of 100 or more.<sup>3</sup>

### **NAICS-Based Index Structure**

The basic unit for sampling and data collection in the PPI is the 6-digit industry under the North American Industry Classification System (NAICS). For this structure, PPI variance data are available for selected industry sector indexes; 3-, 4-, and 5-digit industry group indexes; and for 6-digit industry indexes. (See table C, and table 3 of the 2017 PPI variance data release.) The NAICS-based indexes are measures of changes in prices received for the industry's output, including primary, secondary and miscellaneous output, sold outside the industry (that is, its net output).

*Industry sector indexes:* On a 1-month basis in 2017, 5 of 13 industry sector indexes had RSE values of under 50, 7 posted values between 50 and 100, and 1 industry sector index had an RSE value of over 100. On a 12-month basis, 10 of the 13 industry sector indexes had an RSE of under 50. The industry sector indexes with consistently smaller RSE values were the groupings for mining industries, manufacturing industries, and transportation industries. The industry groupings for wholesale trade industries, retail trade industries, and information industries exhibited the largest RSE values in 2017, on both a 1-month and 12-month basis.

*3-, 4-, and 5-digit industry group indexes; and 6-digit industry indexes:* On a 1-month basis in 2017, 15.2 percent of indexes, 117 of 771, had RSE values of under 50, 40.5 percent had RSE values between 50 and 100, and 44.4 percent had RSE values of 100 or more. Reviewing these data by level of aggregation, a larger percentage of 3- and 4-digit aggregate indexes had smaller RSE values, while a larger percentage of 5- and 6-digit indexes posted larger RSE estimates. On a 12-month basis, 411 of 1,017 PPI industry and industry group indexes, 40.4 percent, posted an

RSE of under 50. Roughly 30.9 percent of indexes had an RSE between 50 and 100, while 28.7 percent posted an RSE of 100 or more. Reviewing these 12-month data by level of aggregation, once again, a larger percentage of higher level indexes posted smaller estimates of RSE, while a larger percentage of 5- and 6-digit indexes posted larger RSE estimates.

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<sup>1</sup> This summary includes a discussion of Relative Standard Error (RSE). RSE is defined as the SE divided by the reference statistic, multiplied by 100. An RSE of less than 50 reflects an SE that is half as large as the reference statistic, suggesting a relatively narrow confidence interval and 95-percent confidence relative to no change. An RSE of 50 or more but less than 100 represents an intermediate-width confidence interval that does not provide 95-percent confidence relative to no change. An RSE of 100 or more generally identifies an index with a wide 95-percent confidence interval; however, if a reference statistic is close to zero, the usefulness of RSE as an analysis tool diminishes substantially.

<sup>2</sup> Stage 4 producers primarily produce final demand goods, services, and construction, stage 3 producers primarily produce output for stage 4, stage 2 producers primarily produce output for stage 3, and stage 1 producers generally produce output for stage 2. The stage-based indexes measure changes in prices paid by each stage for goods, services, and construction, excluding capital investment.

<sup>3</sup> For the 1- and 12-month RSE distributions discussed here and in the following section, indexes with median absolute percent changes of less than 0.1 percent were excluded (other than the indexes for agricultural products, which are considered to reflect a census of information). As mentioned in note 1, when a reference statistic is close to zero, the usefulness of RSE as an analysis tool diminishes substantially.

**Table A. Variance estimates for selected PPI Final Demand–Intermediate Demand indexes, 2017**

Index	1-month median absolute percent change	1-month median standard error	12-month median absolute percent change	12-month median standard error	1-month relative standard error	12-month relative standard error
<b>Final Demand</b>						
Final demand	0.21	0.11	2.37	0.25	52.4	10.5
Final demand goods	0.36	0.08	3.39	0.18	22.2	5.3
Final demand foods	0.31	0.21	1.82	0.37	67.7	20.3
Final demand energy	1.51	0.38	10.43	0.81	25.2	7.8
Final demand goods less foods and energy	0.15	0.05	2.15	0.13	33.3	6.0
Final demand services	0.17	0.17	1.91	0.38	100.0	19.9
Final demand trade services	0.58	0.44	1.64	1.07	75.9	65.2
Final demand transportation and warehousing services	0.49	0.20	1.81	0.42	40.8	23.2
Final demand services, other	0.18	0.11	1.98	0.25	61.1	12.6
Final demand construction	0.08	0.05	2.18	0.19	62.5	8.7
<b>Intermediate Demand (ID) by Commodity Type</b>						
Processed goods for intermediate demand	0.35	0.13	4.69	0.35	37.1	7.5
Processed foods and feeds	0.35	0.27	0.92	0.45	77.1	48.9
Processed energy goods	1.09	0.44	12.27	1.54	40.4	12.6
Processed materials less foods and energy	0.35	0.14	3.51	0.32	40.0	9.1
Unprocessed goods for intermediate demand	0.91	0.20	8.47	0.50	22.0	5.9
Unprocessed foodstuffs and feedstuffs	1.98	0.00	3.10	0.00	0.0	0.0
Unprocessed energy materials	3.74	0.52	11.42	1.41	13.9	12.3
Unprocessed nonfood materials less energy	1.05	0.43	11.90	1.06	41.0	8.9
Services for intermediate demand	0.30	0.20	2.70	0.39	66.7	14.4
Trade services for intermediate demand	0.38	0.62	2.80	1.69	163.2	60.4
Transportation and warehousing services for ID	0.18	0.09	1.92	0.44	50.0	22.9
Services for ID, other	0.33	0.21	2.65	0.40	63.6	15.1
Construction for intermediate demand	0.11	0.09	2.41	0.91	81.8	37.8
<b>Intermediate Demand (ID) by Production Flow</b>						
Stage 4 intermediate demand	0.24	0.13	2.95	0.25	54.2	8.5
Total goods inputs to stage 4 intermediate demand	0.23	0.07	2.95	0.22	30.4	7.5
Total services inputs to stage 4 intermediate demand	0.40	0.24	2.97	0.49	60.0	16.5
Total construction inputs to stage 4 ID	0.11	0.09	2.41	0.91	81.8	37.8
Stage 3 intermediate demand	0.30	0.14	4.35	0.31	46.7	7.1
Total goods inputs to stage 3 intermediate demand	0.47	0.18	6.17	0.37	38.3	6.0
Total services inputs to stage 3 intermediate demand	0.22	0.21	2.49	0.51	95.5	20.5
Total construction inputs to stage 3 ID	0.11	0.09	2.41	0.91	81.8	37.8
Stage 2 intermediate demand	0.49	0.14	4.55	0.28	28.6	6.2
Total goods inputs to stage 2 intermediate demand	1.04	0.17	7.17	0.43	16.3	6.0
Total services inputs to stage 2 intermediate demand	0.13	0.21	2.68	0.40	161.5	14.9
Total construction inputs to stage 2 ID	0.11	0.09	2.41	0.91	81.8	37.8
Stage 1 intermediate demand	0.42	0.23	5.97	0.55	54.8	9.2
Total goods inputs to stage 1 intermediate demand	0.77	0.29	9.03	0.82	37.7	9.1
Total services inputs to stage 1 intermediate demand	0.44	0.30	2.15	0.72	68.2	33.5
Total construction inputs to stage 1 ID	0.11	0.09	2.41	0.91	81.8	37.8

**Table B. Relative standard error (RSE) counts and percentages for selected PPI commodity-based indexes, 2017**

1-month RSE counts and percentages			12-month RSE counts and percentages		
Category	Count	% total	Category	Count	% total
RSE < 50	196	19.0	RSE < 50	644	42.9
50 ≤ RSE < 100	398	38.6	50 ≤ RSE < 100	446	29.7
RSE ≥ 100	436	42.3	RSE ≥ 100	412	27.4
Total	1,030	100.0	Total	1,502	100.0

Note: Indexes with median absolute percent changes of less than 0.1 percent were excluded from these counts. When the reference statistic is close to zero, the usefulness of RSE as an analysis tool diminishes substantially. These counts are based on values in table 2 of the 2017 PPI variance estimate release.

**Table C. Relative standard error (RSE) counts and percentages for selected PPI industry-based indexes, 2017**

1-month RSE counts and percentages			12-month RSE counts and percentages		
Category	Count	% total	Category	Count	% total
<b>3-digit industry group</b>			<b>3-digit industry group</b>		
RSE < 50	13	30.2	RSE < 50	27	51.9
50 ≤ RSE < 100	17	39.5	50 ≤ RSE < 100	14	26.9
RSE ≥ 100	13	30.2	RSE ≥ 100	11	21.2
Total	43	100.0	Total	52	100.0
<b>4-digit industry group</b>			<b>4-digit industry group</b>		
RSE < 50	22	17.6	RSE < 50	70	45.8
50 ≤ RSE < 100	57	45.6	50 ≤ RSE < 100	49	32.0
RSE ≥ 100	46	36.8	RSE ≥ 100	34	22.2
Total	125	100.0	Total	153	100.0
<b>5-digit industry group</b>			<b>5-digit industry group</b>		
RSE < 50	30	13.0	RSE < 50	117	39.5
50 ≤ RSE < 100	96	41.6	50 ≤ RSE < 100	98	33.1
RSE ≥ 100	105	45.5	RSE ≥ 100	81	27.4
Total	231	100.0	Total	296	100.0
<b>6-digit industry</b>			<b>6-digit industry</b>		
RSE < 50	52	14.0	RSE < 50	197	38.2
50 ≤ RSE < 100	142	38.2	50 ≤ RSE < 100	153	29.7
RSE ≥ 100	178	47.8	RSE ≥ 100	166	32.2
Total	372	100.0	Total	516	100.0
<b>All categories</b>			<b>All categories</b>		
RSE < 50	117	15.2	RSE < 50	411	40.4
50 ≤ RSE < 100	312	40.5	50 ≤ RSE < 100	314	30.9
RSE ≥ 100	342	44.4	RSE ≥ 100	292	28.7
Total	771	100.0	Total	1,017	100.0

Note: Indexes with median absolute percent changes of less than 0.1 percent were excluded from these counts. When the reference statistic is close to zero, the usefulness of RSE as an analysis tool diminishes substantially. These counts are based on values in table 3 of the 2017 PPI variance estimate release.