Summary of variance estimates for PPI price changes, 2018

Final Demand-Intermediate Demand (FD-ID) System

Final demand: The 1-month median absolute percent change for the final demand index in 2018 was 0.37 percent, and the accompanying standard error (SE) was 0.10 percent. (See table A, and table 1 of the 2018 PPI variance data release.) Margins of error are commonly 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 median absolute percent change for the final demand index in 2018 excludes zero. Therefore, in a typical month in 2018, the percent change in the final demand index was statistically significant, relative to no change, at a 95-percent level of confidence. The *relative standard error* (RSE) values for the major components of the final demand index varied in 2018.[1] Based on calculations of RSE, the 1-month confidence interval for the goods component of final demand was narrower than it was for the services and construction components. On a 12-month basis in 2018, the median absolute percent change for the final demand index was 2.89 percent, and the corresponding SE was 0.23 percent. RSE measures for the 12-month estimates indicate that the 95-percent confidence intervals for the final demand index and each of its major components—goods, services, and construction—were substantially narrower on a 12-month basis than they were for the 1-month estimates.

Intermediate demand by commodity type: The 1-month median absolute percent change in the index for processed goods for intermediate demand was 0.67 percent in 2018, and the SE value was 0.11 percent. On a 12-month basis, the corresponding values were 5.40 percent and 0.31 percent. Comparing RSE values for the 1- and 12-month calculations within processed goods for intermediate demand, estimates for the 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, the 2018 reference statistics and SE values for the 1-month and 12-month analyses were generally larger in absolute terms, compared with the indexes for processed goods for intermediate demand; however, the RSE estimates were, for the most part, similar. Within the services for intermediate demand category, results aligned with those for final demand services. First, 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. Second, the 12-month SE values revealed narrower confidence intervals, on an RSE basis, than did the 1-month values. Third, on a 1-month basis the RSE values for intermediate demand services were somewhat larger than those calculated for processed and unprocessed goods for intermediate demand, while the 12-month results were more closely aligned.

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 2018, 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 consistently smaller for the 12-month data compared to the 1-month data.[2]

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 producer. Variance data are provided for 2-, 3-, 4-, and 6-digit commodity indexes. On a 1-month basis in 2018, 20.3 percent of PPI commodity indexes for which SE values were published, 222 of 1,092, posted RSE values of under 50. (See table B, and table 2 of the 2018 PPI variance data release.) Roughly 39.6 percent had RSE values between 50 and 100, while 40.1 percent had RSE values of 100 or more. On a 12-month basis, 790 of 1,493 PPI commodity indexes, 52.9 percent, posted RSE values of under 50. About 25.1 percent of the indexes had RSE values between 50 and 100, and 22.0 percent had RSE values of 100 or more.[3]

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 2018 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 2018, 6 of 12 industry sector indexes had RSE values of under 50, 3 posted values between 50 and 100, and 3 industry sector indexes had RSE values of over 100. On a 12-month basis, 11 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 larger RSE values in 2018, 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 2018, 16.7 percent of indexes, 135 of 810, posted RSE values of under 50, 47.2 percent had RSE values between 50 and 100, and 36.2 percent exhibited 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, 528 of 1,011 PPI industry and industry group indexes, 52.2 percent, posted an RSE of under 50. Roughly 27.5 percent of indexes had an RSE between 50 and 100, while 20.3 percent exhibited 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.

---

[1] 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.

[2] 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.

[3] 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, 2018

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
Final Demand						
Final demand	0.37	0.10	2.89	0.23	27.0	8.0
Final demand goods	0.41	0.08	3.31	0.19	19.5	5.7
Final demand foods	0.65	0.19	1.07	0.35	29.2	32.7
Final demand energy	1.47	0.35	9.69	0.68	23.8	7.0
Final demand goods less foods and energy	0.18	0.05	2.60	0.26	27.8	10.0
Final demand services	0.19	0.14	2.67	0.33	73.7	12.4
Final demand trade services	0.35	0.43	1.78	0.91	122.9	51.1
Final demand transportation and warehousing services	0.52	0.21	5.68	0.49	40.4	8.6
Final demand services, other	0.23	0.10	2.66	0.27	43.5	10.2
Final demand construction	0.13	0.04	3.85	0.23	30.8	6.0
Intermediate Demand (ID) by Commodity Type						
Processed goods for intermediate demand	0.67	0.11	5.40	0.31	16.4	5.7
Processed foods and feeds	0.69	0.25	0.80	0.57	36.2	71.3
Processed energy goods	1.71	0.37	11.39	1.25	21.6	11.0
Processed materials less foods and energy	0.39	0.11	4.31	0.34	28.2	7.9
Unprocessed goods for intermediate demand	2.50	0.32	4.77	0.56	12.8	11.7
Unprocessed foodstuffs and feedstuffs	2.19	0.00	1.39	0.00	0.0	0.0
Unprocessed energy materials	4.19	0.67	12.80	1.30	16.0	10.2
Unprocessed nonfood materials less energy	1.07	0.51	5.96	1.11	47.7	18.6
Services for intermediate demand	0.24	0.14	3.13	0.38	58.3	12.1
Trade services for intermediate demand	0.52	0.56	4.16	1.34	107.7	32.2
Transportation and warehousing services for ID	0.23	0.11	4.10	0.32	47.8	7.8
Services for ID, other	0.21	0.13	2.82	0.42	61.9	14.9
Construction for intermediate demand	0.18	0.15	1.64	0.55	83.3	33.5
Intermediate Demand (ID) by Production Flow						
Stage 4 intermediate demand	0.34	0.10	3.59	0.25	29.4	7.0
Total goods inputs to stage 4 intermediate demand	0.48	0.08	3.95	0.22	16.7	5.6
Total services inputs to stage 4 intermediate demand	0.20	0.17	3.16	0.51	85.0	16.1
Total construction inputs to stage 4 ID	0.18	0.15	1.64	0.55	83.3	33.5
Stage 3 intermediate demand	0.84	0.12	4.49	0.29	14.3	6.5
Total goods inputs to stage 3 intermediate demand	1.20	0.16	5.87	0.40	13.3	6.8
Total services inputs to stage 3 intermediate demand	0.20	0.17	3.15	0.45	85.0	14.3
Total construction inputs to stage 3 ID	0.18	0.15	1.64	0.55	83.3	33.5
Stage 2 intermediate demand	0.84	0.16	5.23	0.30	19.0	5.7
Total goods inputs to stage 2 intermediate demand	1.64	0.29	8.16	0.50	17.7	6.1
Total services inputs to stage 2 intermediate demand	0.15	0.11	2.88	0.39	73.3	13.5
Total construction inputs to stage 2 ID	0.18	0.15	1.64	0.55	83.3	33.5
Stage 1 intermediate demand	0.67	0.19	5.68	0.41	28.4	7.2
Total goods inputs to stage 1 intermediate demand	0.79	0.26	7.73	0.66	32.9	8.5
Total services inputs to stage 1 intermediate demand	0.38	0.26	3.48	0.55	68.4	15.8
Total construction inputs to stage 1 ID	0.18	0.15	1.64	0.55	83.3	33.5

Table B. Relative standard error (RSE) counts and percentages for selected PPI commodity-based indexes, 2018

1-month RSE counts and percentages			12-month RSE counts and percentages		
Category	Count	% total	Category	Count	% total
RSE < 50	222	20.3	RSE < 50	790	52.9
50 ≤ RSE < 100	432	39.6	50 ≤ RSE < 100	374	25.1
RSE ≥ 100	438	40.1	RSE ≥ 100	329	22.0
Total	1,092	100.0	Total	1,493	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 2018 PPI variance estimate release.

Table C. Relative standard error (RSE) counts and percentages for selected PPI industry-based indexes, 2018

1-month RSE counts and percentages			12-month RSE counts and percentages		
Category	Count	% total	Category	Count	% total
3-digit industry group			**3-digit industry group**		
RSE < 50	15	31.9	RSE < 50	35	67.3
50 ≤ RSE < 100	19	40.4	50 ≤ RSE < 100	9	17.3
RSE ≥ 100	13	27.7	RSE ≥ 100	8	15.4
Total	47	100.0	Total	52	100.0
4-digit industry group			**4-digit industry group**		
RSE < 50	28	21.7	RSE < 50	93	61.2
50 ≤ RSE < 100	56	43.4	50 ≤ RSE < 100	32	21.1
RSE ≥ 100	45	34.9	RSE ≥ 100	27	17.8
Total	129	100.0	Total	152	100.0
5-digit industry group			**5-digit industry group**		
RSE < 50	35	14.6	RSE < 50	148	50.2
50 ≤ RSE < 100	118	49.4	50 ≤ RSE < 100	87	29.5
RSE ≥ 100	86	36.0	RSE ≥ 100	60	20.3
Total	239	100.0	Total	295	100.0
6-digit industry			**6-digit industry**		
RSE < 50	57	14.4	RSE < 50	252	49.2
50 ≤ RSE < 100	189	47.8	50 ≤ RSE < 100	150	29.3
RSE ≥ 100	149	37.7	RSE ≥ 100	110	21.5
Total	395	100.0	Total	512	100.0
All categories			**All categories**		
RSE < 50	135	16.7	RSE < 50	528	52.2
50 ≤ RSE < 100	382	47.2	50 ≤ RSE < 100	278	27.5
RSE ≥ 100	293	36.2	RSE ≥ 100	205	20.3
Total	810	100.0	Total	1,011	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 2018 PPI variance estimate release.