Summary of variance estimates for PPI price changes, 2019

Final Demand-Intermediate Demand (FD-ID) System

Final demand: The 1-month median absolute percent change for the final demand index in 2019 was 0.26 percent, and the 1-month median standard error (SE) was 0.14 percent. (See table A, and table 1 of the 2019 PPI variance data release.) Margins of error are commonly expressed as plus and minus two standard errors, providing a 95-percent confidence interval with regard to the true change in a reference statistic. For 2019, subtracting two median SE values from the 1-month median absolute percent change for the final demand index includes zero. Therefore, on average in 2019, the 1-month percent change in the final demand index was not statistically significant, relative to no change, at a 95-percent level of confidence. (Based on actual 1-month percent change and accompanying SE values, the final demand index failed this test of statistical significance 6 of 12 months in 2019.) The *relative standard error* (RSE) values for the major components of the final demand index varied in 2019.[1] Based on calculations of RSE, the 1-month confidence interval for the goods component of final demand was relatively narrower than it was for the services and construction components. On a 12-month basis in 2019, the median absolute percent change for the final demand index was 1.75 percent, and the median SE was 0.26 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 consistently 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 0.23 percent in 2019, and the median SE was 0.12 percent. On a 12-month basis, the corresponding values were 2.01 percent and 0.26 percent. Reviewing RSE values for the 1- and 12-month calculations within processed goods for intermediate demand, 12-month results were consistently smaller than were 1-month estimates. In addition, 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 2019 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 in magnitude. For the services for intermediate demand category, results aligned with those for final demand services. First, on a 1-month basis, the RSE values for intermediate demand services were somewhat larger than those calculated for intermediate demand goods, while the 12-month results were more closely aligned. Second, the 12-month SE values revealed narrower confidence intervals, on an RSE basis, than did the 1-month values. Third, 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.

Intermediate demand by production flow: The production flow treatment of intermediate demand organizes business-to-business type transactions by production stage, excluding transactions relating to capital investment purchases, 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 2019, the SE values calculated for the production-flow system closely paralleled those calculated for the commodity-type system. First, on a 1-month basis, 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 2019, 16.2 percent of PPI commodity indexes for which SE values were published, 166 of 1,024, posted RSE values of under 50. (See table B, and table 2 of the 2019 PPI variance data release.) Roughly 36.3 percent had RSE values between 50 and 100, while 47.5 percent of PPI commodity-based indexes had RSE values of 100 or more. On a 12-month basis, 723 of 1,490 PPI commodity indexes, 48.5 percent, exhibited RSE values of under 50. About 27.7 percent of the indexes had RSE values between 50 and 100, and 23.8 percent posted 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 2019 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 2019, 6 of 11 industry sector indexes had RSE values of under 50, 2 posted values between 50 and 100, and 3 industry sector indexes had values of over 100. The industry sector indexes for total mining industries and total manufacturing industries had the smallest RSE values, while the industry sector indexes for total wholesale trade industries, total trade industries (combined wholesale and retail trade), and information industries posted larger RSE values in 2019. On a 12-month basis, 12 of the 13 industry sector indexes had RSE values of under 50. Only the industry sector index for information industries had a 12-month RSE above 50, posting an RSE of 88.2.

3-, 4-, and 5-digit industry group indexes; and 6-digit industry indexes: On a 1-month basis in 2019, 10.7 percent of PPI industry and industry group indexes, 82 of 767, posted RSE values of under 50, 39.6 percent had RSE values between 50 and 100, and 49.7 percent posted 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, 519 of 986 PPI industry and industry group indexes, 52.6 percent, posted RSE values of under 50. Roughly 29.2 percent of indexes had an RSE between 50 and 100, while 18.2 percent exhibited an RSE of 100 or more. Reviewing the 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, 2019

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	0.26	0.14	1.75	0.26	53.8	14.9
Final demand goods	0.33	0.08	0.64	0.14	24.2	21.9
Final demand foods	0.38	0.22	1.98	0.32	57.9	16.2
Final demand energy	1.76	0.39	5.88	0.51	22.2	8.7
Final demand goods less foods and energy	0.09	0.04	1.23	0.17	44.4	13.8
Final demand services	0.28	0.20	2.33	0.39	71.4	16.7
Final demand trade services	0.43	0.60	2.57	1.14	139.5	44.4
Final demand transportation and warehousing services	0.66	0.28	2.99	0.60	42.4	20.1
Final demand services, other	0.20	0.13	2.12	0.24	65.0	11.3
Final demand construction	0.10	0.06	5.24	0.23	60.0	4.4
Intermediate Demand (ID) by Commodity Type						
Processed goods for intermediate demand	0.23	0.12	2.01	0.26	52.2	12.9
Processed foods and feeds	0.14	0.26	1.36	0.48	185.7	35.3
Processed energy goods	1.66	0.52	6.33	0.76	31.3	12.0
Processed materials less foods and energy	0.23	0.10	1.80	0.30	43.5	16.7
Unprocessed goods for intermediate demand	1.84	0.40	7.49	0.93	21.7	12.4
Unprocessed foodstuffs and feedstuffs	1.24	0.00	2.06	0.00	0.0	0.0
Unprocessed energy materials	3.25	0.95	15.91	1.94	29.2	12.2
Unprocessed nonfood materials less energy	1.14	0.50	4.89	2.09	43.9	42.7
Services for intermediate demand	0.20	0.16	2.58	0.39	80.0	15.1
Trade services for intermediate demand	0.57	0.62	4.04	1.54	108.8	38.1
Transportation and warehousing services for ID	0.24	0.14	2.95	0.44	58.3	14.9
Services for ID, other	0.21	0.13	2.09	0.30	61.9	14.4
Construction for intermediate demand	0.14	0.12	2.87	1.02	85.7	35.5
Intermediate Demand (ID) by Production Flow						
Stage 4 intermediate demand	0.15	0.11	1.49	0.27	73.3	18.1
Total goods inputs to stage 4 intermediate demand	0.21	0.09	0.54	0.16	42.9	29.6
Total services inputs to stage 4 intermediate demand	0.31	0.21	2.92	0.51	67.7	17.5
Total construction inputs to stage 4 ID	0.14	0.12	2.87	1.02	85.7	35.5
Stage 3 intermediate demand	0.26	0.12	0.86	0.25	46.2	29.1
Total goods inputs to stage 3 intermediate demand	0.83	0.16	2.32	0.33	19.3	14.2
Total services inputs to stage 3 intermediate demand	0.25	0.20	2.75	0.46	80.0	16.7
Total construction inputs to stage 3 ID	0.14	0.12	2.87	1.02	85.7	35.5
Stage 2 intermediate demand	0.55	0.17	2.91	0.38	30.9	13.1
Total goods inputs to stage 2 intermediate demand	1.31	0.33	8.92	0.82	25.2	9.2
Total services inputs to stage 2 intermediate demand	0.32	0.15	1.97	0.32	46.9	16.2
Total construction inputs to stage 2 ID	0.14	0.12	2.87	1.02	85.7	35.5
Stage 1 intermediate demand	0.45	0.19	2.55	0.43	42.2	16.9
Total goods inputs to stage 1 intermediate demand	0.62	0.29	5.75	0.66	46.8	11.5
Total services inputs to stage 1 intermediate demand	0.36	0.25	2.75	0.59	69.4	21.5
Total construction inputs to stage 1 ID	0.14	0.12	2.87	1.02	85.7	35.5

Table B. Relative standard error (RSE) counts and percentages for selected PPI commodity-based indexes, 2019

1-month RSE counts and percentages			12-month RSE counts and percentages		
Category	**Count**	**% total**	**Category**	**Count**	**% total**
RSE < 50	166	16.2	RSE < 50	723	48.5
50 ≤ RSE < 100	372	36.3	50 ≤ RSE < 100	413	27.7
RSE ≥ 100	486	47.5	RSE ≥ 100	354	23.8
Total	1,024	100.0	Total	1,490	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 2019 PPI variance estimate release.

Table C. Relative standard error (RSE) counts and percentages for selected PPI industry-based indexes, 2019

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	11	22.9	RSE < 50	32	60.4
50 ≤ RSE < 100	16	33.3	50 ≤ RSE < 100	14	26.4
RSE ≥ 100	21	43.8	RSE ≥ 100	7	13.2
Total	48	100.0	Total	53	100.0
4-digit industry group			**4-digit industry group**		
RSE < 50	15	11.6	RSE < 50	88	57.1
50 ≤ RSE < 100	58	45.0	50 ≤ RSE < 100	41	26.6
RSE ≥ 100	56	43.4	RSE ≥ 100	25	16.2
Total	129	100.0	Total	154	100.0
5-digit industry group			**5-digit industry group**		
RSE < 50	20	8.8	RSE < 50	149	52.7
50 ≤ RSE < 100	92	40.5	50 ≤ RSE < 100	85	30.0
RSE ≥ 100	115	50.7	RSE ≥ 100	49	17.3
Total	227	100.0	Total	283	100.0
6-digit industry			**6-digit industry**		
RSE < 50	36	9.9	RSE < 50	250	50.4
50 ≤ RSE < 100	138	38.0	50 ≤ RSE < 100	148	29.8
RSE ≥ 100	189	52.1	RSE ≥ 100	98	19.8
Total	363	100.0	Total	496	100.0
All categories			**All categories**		
RSE < 50	82	10.7	RSE < 50	519	52.6
50 ≤ RSE < 100	304	39.6	50 ≤ RSE < 100	288	29.2
RSE ≥ 100	381	49.7	RSE ≥ 100	179	18.2
Total	767	100.0	Total	986	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 2019 PPI variance estimate release.