International Price Program

The U.S. Import and Export Price Indexes are derived from a monthly business survey of U.S. companies that import and export goods and two services: air freight and air passenger fares. The indexes are commonly referred to as the MXPI where M is used for imports and X for exports. The survey records the price changes of the same item over time; each item in the market basket is used to calculate price indexes that measure the average change in prices of imports and exports of industries and products.

Quick Facts: International Price Program	
Subject areas	Prices
Key measures	Import price indexes, Export price indexes
How the data are obtained	Survey of businesses
Classification system	Geography, Industry, Commodity
Periodicity of data availability	Monthly
Geographic detail	International, National
Scope	Private sector
Key products	• U.S. Import and Export Price Indexes Monthly News Release • Detailed Tables • Industry Pamphlets, Pamphlets by U.S. export region, Pamphlets for Trade with Selected Countries, Fact Sheets, and supplemental publications
Program webpage	www.bls.gov/mxp

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Concepts

The U.S. Import and Export Price Indexes (MXPI) measure the average change in the price level over time for goods and services imported to and exported from the United States. Exports are goods and services sold or transferred by U.S. residents to foreign residents. Imports are goods and services that U.S. residents buy or receive from foreign residents. Price indexes and their movements are used to measure the impact of international trade in the U.S. economy. Each price index represents a basket of products of internationally traded goods or services based on commodity or industry groupings. Each item in the basket has specific characteristics and BLS collects prices for these items over time. This matched-item pricing methodology is the basis of price collection. The import and export price indexes are calculated separately.

The U.S. Bureau of Economic Analysis (BEA) uses U.S. Import and Export Price Indexes to adjust the net exports category of U.S. gross domestic product (GDP) for inflation. The indexes are used to deflate net exports. Net exports are measured as exports less imports. At any point in time, real net exports are the constant value estimate of trade, calculated by subtracting the value of imports from the value of exports, after each is deflated to constant dollars by dividing the aggregate import purchases and export sales by the Import and Export Price Indexes. Real net exports are expressed as

$$\mathrm{RNE}_t = \frac{V_{x,t}}{P_{x,t}} - \frac{V_{m,t}}{P_{m,t}}$$

where

$t = \text{any point in time},$

$V_{m,t} = \text{value of imports},$

$V_{x,t} = \text{value of exports},$

$P_{m,t} = \text{import price index, and}$

$P_{x,t} = \text{export price index.}$

Trade balances published by the U.S. Census Bureau are adjusted for inflation using BLS Import and Export Price Indexes. In particular, the dollar value of trade, a component of the trade balances, is deflated using import and export prices. Doing so aligns the U.S. Census Bureau's trade statistics with corresponding figures published by BEA.

Concepts and definitions of imports and exports

Price measurement in goods and services adheres to the concepts and definitions of U.S. balance of payments (BOP), also known as the U.S. international transactions accounts.[1] For measurement purposes, the BOP concepts that are relevant to the U.S. Import and Export Price Indexes are U.S. resident and economic territory.

U.S. residents. This group includes individuals, governments, business enterprises, trusts, associations, nonprofit institutions, and similar organizations whose economic interests are centered in the United States and who reside or expect to reside in the United States for 1 year or more. U.S. residents do not need to be U.S. citizens or own property in the United States.

Economic Territory. For merchandise goods in the U.S. Import and Export Price Indexes, economic territory is composed of three categories: the U.S. Customs territory, which comprises the 50 states, the District of Columbia, and Puerto Rico; U.S. foreign trade zones (FTZs); and U.S. Customs bonded warehouses.

General imports. The total physical arrivals of merchandise from foreign countries, whether such merchandise enters consumption channels immediately or is entered into bonded warehouses or foreign trade zones.

Total exports. The total physical movement of merchandise out of the United States to foreign countries whether such merchandise is exported from within the U.S. Customs territory or from a bonded warehouse or a U.S. foreign trade zone (FTZ).

Air passenger fare imports. U.S. residents purchase these fares from foreign residents.

Air passenger fare exports. Foreign residents purchase these fares from U.S. residents.

Air freight imports. U.S. residents purchase these services from foreign residents.

Air freight exports. Foreign residents purchase these services from U.S. residents.

Inbound services. This index measures services coming from foreign destinations to the United States.

Outbound services. This index measures services going from the United States to foreign destinations.

The BOP definition of trade is based on the change-of-ownership principle. Trade can occur between related companies, foreign subsidiaries, or related or unrelated establishments or companies. In practice, the concept of ownership between U.S. residents and foreign residents is based on customs frontiers for trade in goods, and the flow of funds for trade in services. These frontiers are delineated by the concept of economic territory.

The U.S. Import and Export Price Indexes survey samples and collects prices on merchandise goods that are general imports and total exports. The scope of the services indexes is currently limited to transportation services and are comprised of the Import and Export Air Passenger Fares Indexes, the Import and Export Air Freight Price Indexes, and the Inbound and Outbound Air Freight Price Indexes.[2] (Data Uses and Fact Sheets.)

Price and index concepts

The Bureau of Labor Statistics (BLS) strives to collect border transaction prices of imports and exports, which best reflect the prices buyers and sellers face. BLS may accept average prices, estimated prices, and list prices.

The transaction may occur between two unrelated parties or between companies that are commercially affiliated with each other. For affiliated companies, the price may be based on accounting considerations rather than market factors. Transaction prices are used regardless of whether or not they are market based.

Prices for items recorded in the U.S. Import and Export Price Indexes are based on accounting terms widely used for international commercial transactions or procurement processes. Examples of different price quotes that might be collected are listed here. The cost-basis price known as f.o.b. (free on board) foreign port is the price at the foreign port of exportation before insurance, freight, or duties are added. Another price basis is f.a.s. (free alongside ship), the price of the item at the U.S. port of embarkation. This price includes insurance charges plus the cost of transporting the good from the place of manufacture to the exit port. A third price basis option is c.i.f. (cost, insurance, freight). The IPP works with companies to specify the price quoted on the basis they are able to provide it consistently over time.[3]

For some product categories, alternative data sources are used in place of directly collected border transaction prices. These non-survey data sources may use other price definitions, such as spot prices and average prices. Spot prices are set in commodity markets and are used to transact trade around the world in raw materials and metals such as copper, silver, gold, and diamonds. Average monthly prices are used in instances where transaction data for a group of same-product transactions provide extensive coverage of trade, for which the product groupings approximate matched-item pricing across time. These alternative data sources are used because they are commonly agreed-upon price quotes for the traders in these products, they tend to reflect market price trends, and they are cost-effective.

Price indexes measure the average change in prices between periods; they do not measure price levels. The monthly movement in the price indexes measures the weighted averages of the price changes for each basket of traded items. These weighted changes of item prices in detailed groups are aggregated using algebraic formulas called index number formulas.

The price change of an item and resulting index change at the aggregate level capture market changes. The key price measurement concept used to capture the market effect is matched-item pricing which requires the business establishment to report the traded price of an identical item each month. Characteristics of the item, details of the transaction, and the price, including price basis, are recorded to validate the market price of an item. When a change to price-determining characteristics occurs for an item being priced in the survey, adjustments are made to remove the effects of these differences from the reported price to maintain the matched-item price change. The adjusted price is then considered the market price for the item and is used to calculate the price change between periods.

Coverage of goods and services

The U.S. Import and Export Price survey covers nearly all trade in merchandise goods, except for military goods, works of art, used items, charity donations, railroad equipment, items leased for less than a year, rebuilt and repaired items, and selected exports (custom-made capital equipment). The U.S. government's administrative records of international trade as reported by business enterprises form the basis from which a sample of international trade transactions is selected. Items are identified from the companies selected and price information collected.

The U.S. Import and Export Price survey covers two services: air passenger fares and air freight prices. For air passenger travel, imports and exports are measured. For air freight transport, imports and exports as well as inbound and outbound prices are measured.

Some prices for goods and services are collected using alternative data sources. (See data sources.)

Units and periodicity of collection

For items whose price is reported by a respondent, the respondent provides the actual transaction price for an item traded as near as possible to the first day of a given month. Each price is reported by the establishment that conducted the trade. An establishment is a physical location of a business enterprise, and may be the entire business enterprise, or one worksite, such as a factory, warehouse, or headquarters of a large enterprise. A business enterprise may have more than one establishment participating in the U.S. Import and Export Price survey; the share of trade of an establishment in each detailed commodity group determines the establishment's probability of selection for that commodity group.

For some prices from alternative data sources, the price transactions or quotes cover the 1-month period over the entire reference month of publication and then compare that with prices over the previous month. The method is used for items, such as petroleum, for which prices are volatile from one day to the next.

Adjustments are made when a price change results from changes in item characteristics. Adjustments are linked to specific items when the company providing the price can break out the price change based on the characteristic change. In cases where substantive change occurs to the item and it is no longer comparable even with adjustment, the item will be replaced if the difference cannot be measured accurately.

More information on how IPP selects establishments and items is available in the design section. Once selected, establishments are asked to provide prices on a monthly basis. In some cases where the item is actively traded monthly, but the price or characteristics for an item do not frequently change, the prices are provided less frequently than once a month.

Classification systems

Merchandise goods and services indexes are calculated under different classification systems. The goods included in the BLS U.S. Import and Export Price Indexes are mapped to three classification systems; two are commodity classifications and one is an industry classification.

The harmonized tariff schedule annotated (HTSA) for imports and schedule B for exports form the joint commodity classification system based on tariff regulations.[4] All U.S. import and export trade are recorded using this classification system. This commodity classification is based on the harmonized system, which is a global classification system that provides an international naming convention to classify traded goods.

The HTSA/schedule B 10-digit level classifications are mapped to the two other classification systems used to calculate the U.S. Import and Export Price Indexes. These are the BEA end-use system, a product classification based on the principal use, which is used to calculate GDP, and the North American Industry Classification System (NAICS), an industry-based classification system.[5] HTSA/schedule B product groups are matched to the detailed NAICS industry that produces similar domestic products. The NAICS indexes provide complementary indexes with many other official industry statistics. The historic trend of the U.S. Import and Export Price Indexes under the same classification category will differ given the different mix and weight of items that are in the import and export samples.

The air passenger and freight services measures use two trade-in-service classifications, the first being the balance of payments concepts, and the second being an international service classification that is also based on mode of supply. Both classifications measure the price trends for payments and receipts between U.S. residents and foreign residents for international services transactions.

Geographic coverage

The U.S. Import and Export Price Indexes are representative of trade in the 50 U.S. states and U.S. territories. Detailed HTSA product classification is the basis from which establishments with a share of trade in that product area are selected. Representative items from selected establishments and product areas are included in the sample for the U.S. Import and Export Price survey. Historically, the majority of U.S. trade has been carried out by a fairly concentrated number of business enterprises. All commodity categories (for goods) are represented in the sample which assures that the indexes are nationally representative, even though trade transactions that are selected for each commodity category and each physical establishment that received or sold the traded item may be concentrated in a geographical area. Goods indexes represent imports and exports for the United States and Puerto Rico. Import and export services indexes are based on cash flows and not geographic territory. Inbound and outbound air freight price indexes represent arrivals to and departures from the geographic area of the United States, Puerto Rico, and other U.S. territories and possessions.

The geographic location of an item's foreign origin or destination is recorded for each item in the survey. The origin of foreign shipment to the United States and the destination of U.S. shipment to foreign locations are each evaluated as price-determining characteristics. Indexes that track price changes of product groups by locality of origin (imports) and/or of destination (exports) cover the following regions and countries:[6]

Both Imports and Exports

- The "Industrialized Countries" category comprises Western Europe, Canada, Japan, Australia, New Zealand, and South Africa
- The "Latin America" category comprises Mexico, Central America, South America, and the Caribbean

- The “Pacific Rim” category comprises China, Japan, Australia, Brunei, Indonesia, Macao, Malaysia, New Zealand, Papua New Guinea, Philippines, and Asian Newly Industrialized Countries
- The individual countries of Canada, China, Germany, Japan, and Mexico for both imports and exports, along with the United Kingdom, and France [7]

Imports only

- The “Asian Newly Industrialized Countries” category comprises Hong Kong, Singapore, South Korea, and Taiwan
- The “Association of Southeast Asian Nations” category comprises Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam
- The “Asia Near East” category comprises Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, and Yemen
- Taiwan

Scope and exclusions

The U.S. Import and Export Price Indexes ideally should include all goods and services. As described previously, air freight price indexes and air passenger fares indexes are calculated. These are published separately from the merchandise goods import and export price indexes. Other import and export service categories are currently not covered due to a lack of funding.[8]

The U.S. Import and Export Price survey collects but does not publish actual prices of individual items or average prices of detailed product categories. This practice maintains confidentiality of business data and statistical standards. For this reason, the indexes cannot be used to measure differences in price levels among different products and services or among different localities of origin. For example, a higher index number for locality A (or product X) does not necessarily mean that prices are higher than for locality B (or product Y) with a lower index number. That only means prices have risen faster for locality A (or product X) since the reference period.

Because the U.S. Import and Export Price Indexes are primarily used as deflators, especially by BEA in calculation of real GDP, care must be exercised when using these data for other purposes. For example, import prices exclude charges for duties because BEA excludes duty when aggregating the net exports component of GDP and the denominator (prices) needs to match the numerator (GDP) when calculating the real value of net exports. Import prices would normally include duties if the objective were to provide a measure of domestic inflation of imported goods.[9] If a 10-percent duty were placed on an imported item and the foreign company absorbed half of the tariff, passing the remainder on to the U.S. buyer, the duty-exclusive indexes produced by BLS would show approximately a 5-percent price decline. By contrast, an index including the duty as part of the price would show an increase of 5 percent.

The U.S. Import and Export Price Indexes are not seasonally adjusted. For those commodities subject to seasonal patterns of trade (air passenger fares) or for which world prices are affected by differences in seasons around the world (grains or vegetables), analysis of data over longer time spans or with rolling 12-month percent changes are the best measure excluding seasonality.

When items are priced in foreign currencies, exchange rates must be used to convert from a foreign currency price to a dollar price. A small share of imports and exports currently surveyed are priced in foreign currencies. The average daily exchange rate from the month prior to the reference month is used to convert prices into dollar terms before calculating indexes. More information on the impact of exchange rates is available in the presentation section.

Key variables of interest

The key variables of interest are the U.S. Import and Export Price Indexes for merchandise goods, including those published by locality of origin and locality of destination respectively, and for air passenger and air freight services, as well as the corresponding percent price changes and relative-importance values. Index measures are published only when value of trade, number of respondents, and number of price quotes maintain the quality of the index and protect the confidentiality of respondent information.

The U.S. Import and Export Price Indexes for merchandise goods are each calculated separately for two commodity classification systems and one industry classification system. Price indexes for goods are published to the four-digit level of product detail under the HTSA/schedule B classification system, and to the five-digit level of product detail under the BEA end-use system. Price indexes for goods industries are published to the six-digit level of industry detail under NAICS.[10] There is one all-goods import price index measure, calculated as the aggregate of detailed BEA end-use system import price indexes.[11] There is an analogous all-goods export price index measure.

The U.S. Import and Export Price Indexes for air passenger fares and air freight prices are published on a balance of payments classification, and the inbound and outbound price indexes for air freight prices use the general agreement on trade in services (GATS) international services classification.[12] The service prices that compose each index are collected by country and published by country or region and for world trade.

Locality price indexes are country- and regional-NAICS import and export price indexes when sufficient data observations are available to support the greater level of detail. Industry coverage is from the two- to four-digit level of detail for imports, manufacturing, nonmanufacturing, and all goods for exports, when publishable, for different countries and regions. The goods prices that compose each industry index are collected by country and published by country or region. The aggregation by origin for each NAICS industry is the worldwide import price index of that NAICS industry, while the aggregation by destination for each NAICS industry is the worldwide export price index of that NAICS industry.

The relative importance of each published price index is provided in the monthly news release. This analytic measure provides details on the importance of a product group in trade and the degree of price movement that occurred in the product group. The relative importance is the percentage of an index's price-updated value share of overall imports or exports at a specific point in time. Relative-importance values are affected by the trade weights at the point at which indexes are reweighted and by index changes relative to other indexes since the reweight point. If an index is rising in value relative to other indexes over time, the relative importance will increase as well. For example, if an import index value for a specific product area is 120.5, while the index value for overall

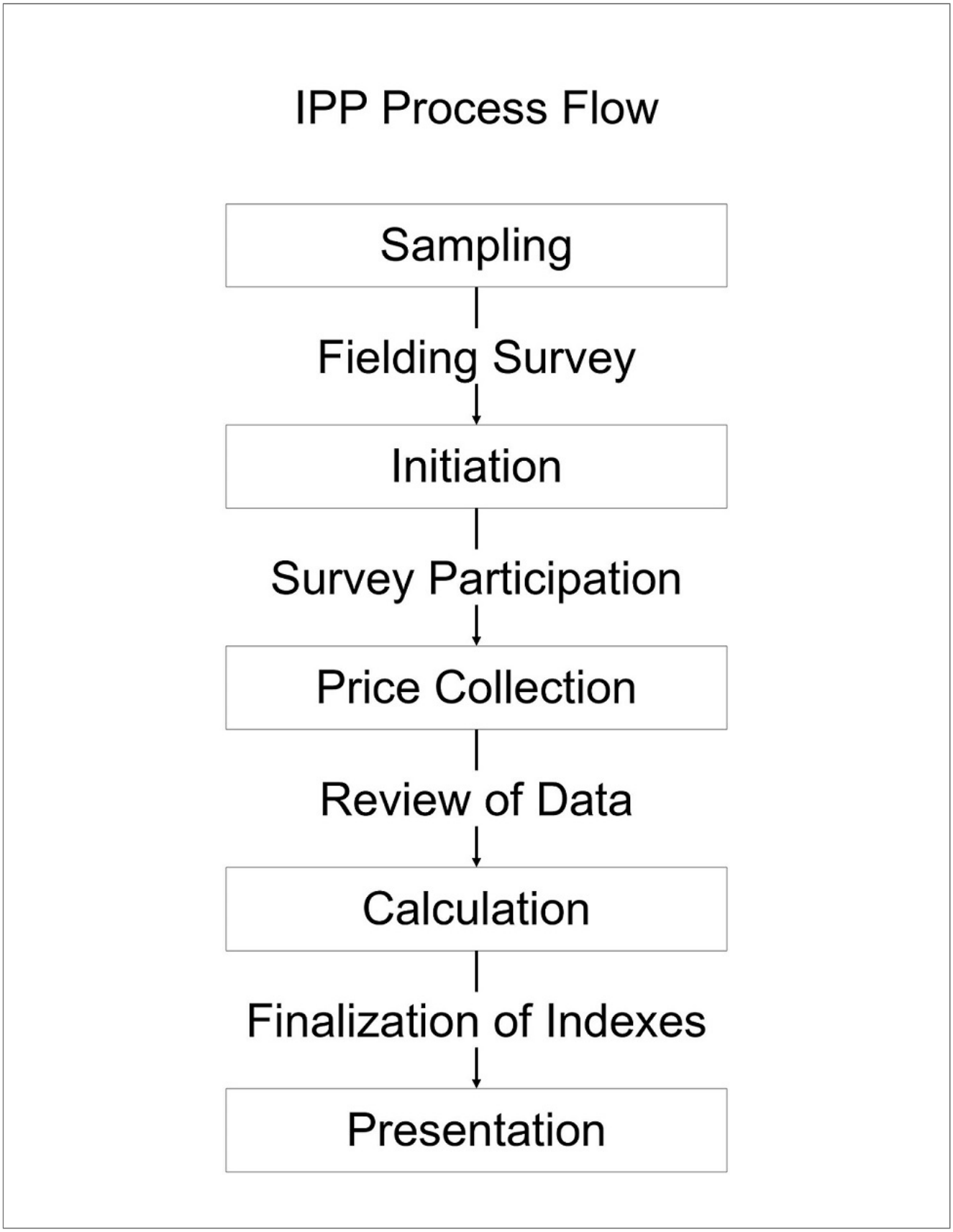
imports is 102.3, the relative importance for that specific product has increased in time compared to the reweight period.

Price indexes and percent changes are published monthly. Prices are measured in U.S. dollars and price indexes are dollar-based indexes.

U.S. Import and Export Price Indexes process flow

In order to produce the U.S. Import and Export Price Indexes, the survey follows a process of selecting items to publish price indexes derived from those items. As shown in exhibit 1, the process includes sampling establishments, contacting establishments to enlist company participation in the survey, and setting up the establishments to regularly submit price information. Monthly price information for each item in the survey is collected. Survey staff review and validate the information and then calculate and publish indexes. (See illustration in exhibit 1.)

Exhibit 1.


IPP Process Flow
Sampling
Fielding Survey
Initiation
Survey Participation
Price Collection
Review of Data
Calculation
Finalization of Indexes
Presentation

NOTES

[1] The balance of payments measures trade by recording goods, services, income, and investment transactions between residents of the United States and other countries on a quarterly basis. Split into different accounts—current, capital, and financial—the balance of payments represents an income statement for overall U.S. economic activity. For more information, see https://www.bea.gov/sites/default/files/methodologies/ONE%20PDF%20-%20IEA%20Concepts%20Methods.pdf.

[2] The U.S. Bureau of Economic Analysis uses the terms “air travel” and “air transport” in place of “air passenger [fares]” and “air freight,” respectively.

[3] For imports the most commonly reported price basis is f.o.b. factory. For exports the most commonly reported price basis is c.i.f.

[4] For more information on HTSA, see https://hts.usitc.gov/current. For more information on Schedule B, see https://www.census.gov/foreign-trade/schedules/b/index.html.

[5] For more information on NAICS, see https://www.census.gov/eos/www/naics/.

[6] U.S. Terms of Trade indexes by locality are published for each locality where a Locality of Origin Import index and a Locality of Destination Index are published.

[7] These are not mutually exclusive groups. The Pacific Rim includes a lot of countries that are also in some other region. All ANIC are in the Pacific Rim which is why we just used that group. The same is not true of the ASEAN group. See comment above. In the case of Singapore, the country is both part of the ANIC and ASEAN groups.

[8] Prior to 2007, services price indexes were available for inbound crude oil tanker freight, inbound ocean liner freight, export travel and tourism, and export postsecondary education services.

[9] Duties might, however, be reflected in the CPI to the degree that the taxes are passed through to consumers.

[10] For NAICS price indexes, items are classified by output industry, as opposed to input industry.

[11] In theory, the aggregate index value for all three classification systems should be the same. In practice, they closely align but are not the same, due to the mechanics of index calculation.

[12] For more information on GATS, see https://www.wto.org/english/tratop_e/serv_e/gatsqa_e.htm.

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Data Sources

There are two types of data sources used for the U.S. Import and Export Price survey. The first type of data are administrative data that form the basis of the sample selection process. For an explanation of these data sources and how they are used, see the design section. The second type of data are the price data used for index calculation. Price data are predominantly collected through the U.S. Import and Export Price survey. In some instances, price data are collected through other administrative or secondary data sources.

The first two stages of sample selection result in a list of establishments and the number and type of items. The sample is based on trade transactions that occurred in the past. For more information on these two stages, see the design section. The third and final stage of the sampling process requires updated item selection by a BLS field economist with the cooperation of the company representative at a sampled establishment. A successful interview with a sampled establishment results in a more detailed list of current items that are actually traded and establishes the items that best represent the mix of goods for the sampled establishment identified during the item sampling stage. The subsequent collection of the monthly price for each item, if traded, forms the basis of price changes that are aggregated into the final price indexes.

Initiation of price survey

For the final stage of the sampling process, a BLS field economist meets with a company representative of a sampled establishment and conducts the initial price survey. The selection of the actual items that constitute the market basket occurs at this stage. During the personal interview, the field economist asks a series of questions to identify the actual products presently being traded and confirms that the establishment is actually still trading in the sampled-product categories. The field economist describes the types of items required for the market basket using detailed product category or classification group descriptions, and the respondent provides examples of commonly traded items with the respective prices and share of total company trade. Items that are traded at least once a year are chosen for the categories required to fill out the survey. The choices depend on the information available starting with actual trade dollar value, then estimated trade dollar value, and finally an estimate on trade dollar value ranking among potential choices. If no information is known about the dollar value, then items are chosen randomly. The field economist records item and price information and price-determining characteristics which include size, composition, country of origin, range of capabilities, and transaction terms; and instructs the survey respondent on the monthly data collection process. Once items are selected, those items are then initiated into the market basket that is then repriced on a monthly basis.

Monthly price collection

Upon the initiation of an item into the market basket, the BLS national office staff coordinates continued monthly price collection with the company respondent. (For more information on the types of goods and services that are covered by the U.S. Import and Export Price survey, see the concepts section.) Survey respondents may transmit the monthly transaction price of the items selected for the survey by a secure internet site or by telephone if more convenient for the respondent. BLS staff may contact the survey respondent to assure price information is submitted by the deadline or to request clarification and validate changes to item characteristics or prices. All

reporting is voluntary and confidential, in accordance with the **BLS report to the Office of Management and Budget's confidential information protection and statistical efficiency act (CIPSEA)**.

Respondents provide prices for items based on actual transactions that occur as close as possible to the first day of the month for which the data are to be published. The recorded price is the actual transaction price for which an item is purchased or sold. The transaction price ideally accounts for discounts and surcharges paid or charged; duties on imports are not counted as part of the price. For more information on what is included in the transaction price, see the concepts section.

A number of prices collected come from intercompany trade, production sharing, or cases for which a company can only provide an average price. For each of those cases, the price still represents the transaction price at the point an item crosses the border. Intercompany trade occurs when the price of items that are purchased or sold are determined through trade within a company or between affiliates of related companies. The price reported may be determined by market-related factors, but that is not always the case. Production sharing is product manufacture shared between two (or more) independent companies or various affiliated units of the same company that are located in different countries. In addition, average prices provided by respondents are occasionally used when items are homogenous and that is the only price they can provide.

Price information may be collected on a less-than monthly schedule if the item is not traded monthly, if the price is set by contract and does not change in intervening months, or to alleviate burden on the respondent. If an item is not traded in a given month, a respondent may provide an estimated price based on what the item price would have been if the item were traded. When the item price is set by contract, the transaction price is carried forward during the duration of the contract until a new price is set. For other methods of handling missing prices when a respondent cannot provide an estimate, see the calculation section.

Some commodity categories are not collected directly through the U.S. Import and Export Price survey. Administrative data sources provide prices on **petroleum imports** and **grain exports**. The U.S. Energy Information Administration (EIA) provides administrative data for all imports of crude petroleum products. The U.S. Department of Agriculture Farm Service Agency provides data for most grain exports. Secondary data sources are used to collect import and export prices for **diamonds and metals**, **air passenger fares**, and petroleum exports. All administrative and secondary source data sets are collected on a monthly basis; the same index calculation methods are applied to directly collected and administrative or secondary source data.

Validation checks

Once received, transaction prices undergo review and verification to validate the quality of responses. When data collected are incomplete or show changes to important data elements, such as the item description, price-determining characteristics, and survey respondent information, additional validation is needed. Industry analysts complete this additional validation by contacting the company respondent to ensure that the item priced remains consistent from month to month. For information on how substitutions, replacements, and quality adjustments are handled, see the calculation section. Industry analysts might also contact respondents in the case of a nonresponse or if the price change leads to an index percent change surpassing a set maximum or minimum

value. The maximum and minimum values are set at 2.5 standard deviations from the average percent change for the index historically.

Data confidentiality and integrity

The Bureau of Labor Statistics (BLS) is strongly committed to protecting the confidentiality of information provided by respondents and ensuring that it is used only for statistical purposes. This pledge of confidentiality means that only BLS employees and agents, such as contract employees or employees of state agencies working on statistical programs under BLS agreements, will ever have access to respondent information. The limitations on use of the data for statistical purposes means that BLS will combine respondent information to produce descriptions, estimates, and analyses regarding the state of the economy without identifying the individual information provided.

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Design

The purpose of the Import and Export Price survey and sample design is to provide a representative and unbiased measure of price change in each published index. For the majority of product categories, the Bureau of Labor Statistics (BLS) conducts the U.S. Import and Export Price survey to collect prices of individual items that represent detailed product categories. For a limited number of product categories, price data come from alternative data sources. (See data sources). Merchandise goods product categories and services product categories are sampled separately.

The sample frame of merchandise goods

The universe of all merchandise goods trade is available from transaction data collected by the U.S. government from importers and exporters. Importers are required to file an entry summary for shipments with the U.S. Customs and Border Protection (CBP) using the Automated Commercial Environment, which is an electronic data collection system. Exporters report merchandise that is exported to countries other than Canada to the Census Bureau using the Automated Export System platform. The Canadian Border Services Agency collects data for export shipments to Canada and provides them to the U.S. government. The trade records provide information on the company, the dollar value and volume of transactions, and the classification of the goods being traded based on the harmonized system (HS). The Bureau of Labor Statistics (BLS) receives the import and export records from CBP and Census Bureau for sampling purposes.

Sample paneling

The sample frame is divided into two non-overlapping product categories, called panels A and B, for imports and exports separately. The panels remain relatively consistent over time and are roughly equal in dollar value. To ensure the most up-to-date sets of sampled items, BLS draws an import sample and an export sample annually from alternating panels. The balance of the dollar value for panels is kept roughly equal by revising on a periodic basis when major revisions to classification systems or trade value occur. (See exhibit 2.)

Exhibit 2. Paneling strategy in the International Price Program

Import panel A	Export panel A
Food and beverages	**Food and beverages**
Crude materials	**Crude materials**
Vehicles	**Minerals and chemicals**
Miscellaneous goods	**Miscellaneous goods**
Import panel B	**Export panel B**
Minerals and chemicals	**Vehicles**
Machinery	**Machinery**

Source: U.S. Bureau of Labor Statistics, International Price Program.

Each panel comprises all records for import or export trade data for a 12-month period. The panels are prepared on a 6-month rolling basis, alternating between imports and exports to ensure both imports and exports are fully resampled every 2 years. At any given time, two to three panels are contributing to the market basket. When items from previous panels are phased out, the process is spread over 12 months to avoid undue loss of coverage to

any published indexes. At the same time, the initial collection of data for a new panel is completed. As a result, the new panel reaches peak initiation at about the same time the earlier panel begins to be eliminated.

Establishments

For all imports and for exports to countries other than Canada, an establishment is defined by the establishment identifier number (EIN), an 11-digit number assigned by the Internal Revenue Service and recorded on the frame transactions for those shipments. In some instances, multiple establishments may be located at the same address. For Canada, export establishments are defined by the combination of the name and zip code of the exporter because data received from the Canadian Border Services Agency do not include U.S. EINs. A company may comprise one or many establishments.

Stratification

A sampling stratum is typically the four-digit level of product detail of the HS and this is the level of publication of price indexes for the HS product classification system. Stratifying by these commodity codes allows the U.S. Import and Export Price Indexes survey to more accurately represent important subsections of trade than if a sample were selected from a non-stratified frame. The U.S. Import and Export Price Indexes survey samples independently within strata, which tends to reduce the sampling error of the estimates derived from the sample.

Determining if a four-digit HS area is a publishable stratum is based on whether the dollar value of trade in that area exceeds a predetermined threshold. The threshold is calculated based on the total number of budgeted field initiation visits, the average number of quotes per establishment that is sent to the field, the total dollar value of the panel being sampled, and the minimum number of quotes to be priced per stratum in order to maintain publishability. The total number of budgeted field initiation visits divided by the average number of quotes per establishment determines the expected number of quotes to be fielded. The total dollar value of the panel is then divided by the expected number of quotes to be fielded and multiplied by the minimum number of quotes to be priced per stratum to maintain publishability.

Product categories are created from the 10-digit HS detail to provide consistency across time and to establish concordances with other product and industry classifications. These product categories are called classification groups. In most cases, classification groups are the 10-digit HS level of aggregation. There are two exceptions. The first is for areas where a series of 10-digit HS level groupings are merged together, generally for cases with small and relatively homogeneous groupings. The second is where a 10-digit harmonized level is split, generally for cases with large groupings that carry a diverse set of items.

The sample process

The sample selection process is carried out in three stages to efficiently identify large traders and ensure that as many indexes can be published at as great a detail as possible by identifying specific import and export items to price over time. The following subsections discuss the three stages in detail so the reader will better understand what takes place at each stage.

Selecting the establishments

The first stage of sampling begins with setting the sample frame. The sample frame comprises 12 months of import or export transactions for all sampled strata in each panel using their respective frame sources. The first stage of the sampling process relies on three constraints:

- an upper bound of item burden for an establishment within a sampling stratum,
- an upper bound of establishments to be fielded for the panel being sampled based on the total number of budgeted field initiation visits, and
- the expected number of items per establishment to be collected.

Using the aforementioned constraints, BLS begins allocating the sample. First, BLS establishes some upper and lower boundaries. BLS also establishes an upper bound of the total number of items to be collected for the sample. This total can be found by multiplying the expected number of items per establishment by the total number of establishments in the sampling frame. Next, BLS allocates the total number of items across all sampled strata on the basis of each stratum's dollar value of trade. The lower boundaries ensure that there is sufficient item coverage at the classification group-level for the three classification systems.

BLS distributes the number of establishments by strata based on the distribution of allocated items and subject to the upper bound of item burden for an establishment. Readjustment of item and establishment allocation occurs throughout the process to meet the minimum number of items and establishments required to satisfy publication criteria.

After the allocation process is completed, establishments are selected independently within sampling strata, which represent product areas at the most detailed level of publishable harmonized indexes. Because the size of trade for establishments varies greatly, selection is based on probability proportionate to size (PPS), where size is defined as dollar value traded. This approach reduces sampling error compared with equal probabilities of selection. Some establishments are selected with 100 percent probability; these are the large, frequent traders in a stratum. The rest of the establishments have probabilities of selection that are proportional to the value of their trade in the stratum. These comparatively smaller traders are designated as uncertainties. An establishment can be selected in more than one stratum and with different probabilities of selection; that is, each stratum is independently sampled.

Some sampling strata have low dollar values of trade, and the corresponding price index may not be publishable because the stratum does not meet the dollar threshold for publication. Even so, sampled establishments in these strata are weighted accordingly and aggregated to a higher level to ensure representativeness of overall trade for all-goods import and export price indexes.

Upon selection of the first-stage sample, the sampled establishments are refined by survey economists. The economists use historical survey data and other reference materials to validate the establishment's name and address. In addition, economists determine if an establishment should be included in the survey based on one of two criteria: the company historically provides price data or is new to the survey. During the first-stage sampling

process, multiple establishments with the same company name and address are combined into one entity representing the unique name and address for data collection, known as the collection unit. Also, establishments that are part of the same company but located at different addresses are combined into a collection unit if survey history or reference-material research suggest data collection should be at one centralized location for the entire company.

Selecting classification groups

The second stage of sampling is carried out in three steps: 1) capping burdens for collection units when necessary; 2) allocating items to selected establishments; and 3) selecting classification groups per establishment. The sampling unit is the classification group within the establishment. The first stage of sampling is determining which establishments BLS will attempt to request data from. The second stage is to determine what groupings of items by establishment BLS will ask about.

A cap is put on burden because BLS does not wish to overwhelm data providers. This is primarily done to control an establishment's item burden for those situations in which it was sampled in multiple strata, in addition to those cases in which multiple establishments were combined into one collection unit during refinement. If either or both of these instances occur and result in the collection unit burden exceeding the upper limit, the item burden within each stratum of each establishment constituting the collection group is proportionately reduced. This prevents the overall burden for the collection unit from exceeding the upper limit.

After capping collection-unit burdens, second-stage sample allocation initially distributes the item burden assigned to a sampled establishment within a stratum to the corresponding classification groups by proportional dollar value. The classification group item allocations then undergo a series of readjustments across and within all sampled establishments that trade in these classification groups through an iterative process known as raking. The raking process involves redistributing items across classification groups in order to meet minimum item requirements. This process also ensures each classification group is allocated enough items across establishments to support publishability across the three primary classification-system strata (Bureau of Economic Analysis end use, harmonized, and the North American Industry Classification System) to which they contribute. At the same time, this maintains the item burden that was assigned to each of the sampled establishments in the stratum.

In the second stage of sampling, classification groups are selected with replacement within the sampled establishments. The process uses PPS methodology in which the measure of size is the expected number of items to be selected within each classification group for the establishment. The PPS method may result in a given establishment's classification group being assigned a number of items, as items are selected multiple times based upon the relative proportion of the classification group's value within the establishment.

Both raking and selection with replacement are performed in order to control respondent burden while maximizing the quality of price indexes by ensuring sufficient item coverage for the publication of indexes in the three classification systems.

Further sample refinement occurs when survey economists conduct a final review of the sampled classification groups and counts of items per classification group within the collection units, making any adjustments necessary.

The collection units are then assigned to the regions where the data collection occurs and the field economist contacts the company to carry out the initial interview and conduct the price survey.

Third stage of sampling

The third stage of sample selection occurs at the first interview with the company respondent. During that interview, the respondent provides unique items within each sampled classification group. The respondent indicates a dollar share, weight, or importance to establish how representative an item is of a company's trade. The respondent-identified weights are then used to draw a weighted random selection of items. In cases where the company is unable to identify importance, items are selected randomly.

Once the items are established, the same unique items are subsequently priced over time by the respondent. Sampled items are priced for approximately 5 years until the items are replaced by a fresh sample. Generally, each index spans two to three panels. See the calculation section for specifics on how indexes are calculated.

For more information on the methods used to collect prices for sampled items, see data sources.

Services

U.S. Import and Export Price Indexes are calculated for air passenger travel and air freight transportation.

For the air passenger fares indexes, there is no need to sample. The full universe of data is drawn from administrative data from the Airlines Reporting Company. The air passenger fares universe consists of fares to and from the United States and U.S. territories, and to and from roughly 230 foreign countries serviced by more than 200 U.S. and foreign airlines. In addition, the Export Air Passenger Fares Index includes foreign-to-foreign fares when foreign residents are flying on U.S. airline carriers.

The universe for the air freight price indexes is aggregated transaction data published by the Bureau of Transportation Statistics, U.S. Department of Transportation (DOT). Freight is tendered by the company that needs items shipped to an airline for transportation, excluding mail and personal baggage; the service measured includes shipment from airport to airport only, omitting any ground transport or port service costs, which are classified as different types of services. Data cover both U.S. and foreign air carriers, with at least one point of service in the United States or one of its territories. The records are reported in the DOT T-100 International Market file and include route-specific information: origin and destination airports, air carrier names and nationalities, and the amount of cargo transported.

Air freight services are fully resampled approximately every 5 years. For the air freight price indexes sample, BLS uses probability sampling methods to select a sample of company-routes from the T-100 file that is representative of international air freight transportation. A company route is composed of an air carrier transporting freight internationally between a specific origin and destination.

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Calculation

The U.S. Import and Export Price Indexes are modified Laspeyres indexes that aggregate import and export price data. The data are gathered mostly from sampled companies using trade dollar value weights produced by the Census Bureau. (For more information on data sources and the sampling process, see the data sources and design sections.)

Aggregation

For merchandise goods, the U.S. Import and Export Price Indexes are calculated using multiple classification systems for aggregation of data. The classification systems are the U.S. harmonized tariff schedule for imports and schedule B statistical classification for exports (harmonized), the North American Industrial Classification System (NAICS), and the end use classification system developed by the Bureau of Economic Analysis. For each of the classification groups, aggregation to the all import price index results in the same measure regardless of the classification structure. The same is true for exports. Only one top-level goods import and one top-level goods export price index are published and use the end use classification. For more information on how these classification systems relate to the U.S. Import and Export Price Indexes, see the concepts section.

For the harmonized system (HS), the NAICS indexes, and the end-use indexes, the most detailed calculated-index levels are the four-digit, the six-digit, and the five-digit levels of aggregation, respectively. Larger digits signify a greater level of detail.

The aggregation example in exhibit 3 shows an example of how an imported item (rivet), shown at the bottom of the exhibit, is mapped up through weight group and classification groups through the three classification systems. A similar mechanism occurs for exports. Note that not all calculated indexes and index levels are published.

Exhibit 3.

Index weights

The mapping structure and index weights are based upon a 2-year lagged classification structure and related fixed nominal dollar value of trade, such that the weights used to calculate price indexes starting with the January release use the most recent final annual foreign trade statistics collected by the Census Bureau.

Individual item weights are not available in the sample frame from which they are chosen. Instead, the weights are derived from the company weights based on trade weights within the 10-digit harmonized classification group from which the items are selected. For more detail on classification groups, see the design section. Company weights within a classification group are based on dollar value and the probability of selection. The company weight is distributed evenly among the sampled items in the classification group. Items may represent multiple items in the same sample in an effort to reduce company burden. So if similar items are sampled, only one may be collected where the item would retain the weight of each of the sampled items. In that case, the item weight within the sample would be multiplied by the number of items that the item represents. Items may also be sampled in multiple samples in which case the weights for each sample are summed. In effect, the item represents two or more items, one selected in each sample.

The individual item price changes are aggregated into progressively more generalized groupings—defined as weight groups, classification groups, and strata—until an overall price change is calculated for all imports and all exports. The weight group is a single company within a classification group, where the weight is derived by summing the company's item weights. The weight groups are used to aggregate indexes to the classification group level. Classification groups are weighted by the 2-year lagged trade dollar values and are aggregated to the most detailed strata of each classification system for calculation and publication purposes.

For air transportation services, IPP calculates import and export air freight and air passenger price indexes using the balance of payments concept of payments and receipts between U.S. and foreign residents. In addition, inbound and outbound air freight price indexes are directional and measure the transportation of freight between the United States and foreign countries. At the lowest level of aggregation, items are mapped by locality using the U.S. Department of Transportation's world area codes. At the most aggregated level, each air service measure is aggregated to an all-world price index for imports (exports) and inbound (outbound) separately. (For more information, see the concepts section.)

Modified Laspeyres formula

IPP calculates the U.S. Import and Export Price Indexes using a Lowe, or modified fixed-quantity Laspeyres formula, with trade dollar values or their estimates as weights, which are updated annually on a 2-year lagged basis. Laspeyres indexes measure price change from a base period to the current period using the base period weights. In a Lowe price index, the weight reference period may precede the price reference period. The Laspeyres price index is a special case of the Lowe index where the weight reference period must match the price reference period. The IPP second modification to the Laspeyres formula is the use of a chained index instead of a fixed-base index. With chaining, the current-month index is derived from the index value and price movement from the previous month rather than a base period. The index values from each month can then be chained back to the base period.

Below is the derivation of the modified fixed-quantity Laspeyres formula used to calculate all the U.S. Import and Export Price Indexes.

$$P_t = \left(\frac{\sum p_{i,t} q_{i,0}}{\sum p_{i,0} q_{i,0}}\right) \cdot (100) = \left(\frac{\sum p_{i,t}/p_{i,0}}{\sum p_{i,0} q_{i,0}}\right) \cdot (100)$$

$$P_t = \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0}}\right) \cdot (100) = \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}}\right)\left(\frac{\sum w_{i,0} r_{i,t-1}}{\sum w_{i,0}}\right) \cdot (100)$$

$$P_t = \left(\frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}}\right)(P_{t-1}) = (\mathrm{STR}_t)(\mathrm{LTR}_{t-1})$$

where

P_t = index of collection items at time t,

$p_{i,t}$ = price of item i at time t,

$q_{i,0}$ = quantity of item i in base period 0,

$w_{i,0} = (p_{i,0})(q_{i,0})$ = total revenue of item i in base period 0,

$r_{i,t} = p_{i,t}/p_{i,0}$ = long − term relative of item i at time t,

$STR_t = \frac{\sum w_{i,0} r_{i,t}}{\sum w_{i,0} r_{i,t-1}}$ = short − term ratio of items at time t, and

$LTR_t = P_t$ = long − term relative of items at time t.

Imputation

To maintain an uninterrupted time series, an imputed or estimated price is entered when there are missing price data. Observations could be missing due to erratic reporting on the part of respondents, late data, or strong seasonality in patterns of trade.

Exhibit 4 shows an example of how IPP deals with missing prices. The ellipses represent a value which cannot be computed due to the missing value for item 2 in period 1. The items are used to derive the index values or long-term relatives (LTR) for the next level of aggregation, the company weight group.

Exhibit 4. Imputation

Items	Element	Period 0	Period 1	Period 2
Item 1	Price	$10	$10	$10
	STR	1	1	1
	LTR	100	100	100
Item 2	Price	$20	…	$30
	STR	1	…	…
	LTR	100	…	150
Item 3	Price	$5	$10	$5
	STR	1	2	0.5
	LTR	100	200	100

Note: STR stands for short-term relative. LTR stands for long-term relative.
Source: U.S. Bureau of Labor Statistics, International Price Program.

The missing price for item 2 in period 1, as indicated by the X in exhibit 2, would adversely affect the index because neither the period 1 nor period 2 short-term relative (STR) can be derived for item 2. In order to continue the series, values need to be imputed. There are 2 methods used to impute missing data if a respondent does not report a price.

Cell mean imputation

The first method is cell mean imputation, generally used for items in industries where prices are relatively homogenous, such as raw materials or intermediate goods. Normally, the STR from an item's weight group would be used. However, if none of the items in the weight group have usable price data, then the STR would come from the classification group, the most detailed level harmonized stratum the classification group is mapped to, or potentially a more aggregated level in the HS structure. The HS structure is used when imputing prices. The HS structure is a better match for price change than industry classification or end use because HS is based on product type.

When a suitable STR is found, it is used to impute a price for the item in the missing period. Consequently, if usable price data are received for a later period, the series can be continued by using the last imputed price as the denominator in computing an STR for the item.

Assuming all three items are evenly weighted in this example, the other items in the weight group rise by 50 percent. The imputed value of the missing price would be derived by taking the period 0 price of $20 and multiplying that by the average change for the weight group of 50 percent to get an imputed period 1 price of $30 as seen below in exhibit 5 (item 2, period 1).

Exhibit 5. Cell mean Imputation

Items	Element	Period 0	Period 1	Period 2
Item 1	Price	$10	$10	$10
	STR	1	1	1
	LTR	100	100	100
Item 2	Price	$20	$30	$30
	STR	1	1.5	1
	LTR	100	150	150
Item 3	Price	$5	$10	$5
	STR	1	2	0.5
	LTR	100	200	100

Note: STR stands for short-term relative. LTR stands for long-term relative.
Source: U.S. Bureau of Labor Statistics, International Price Program.

The overall STR and LTR for the weight group can now be calculated for both period 1 and period 2.

$$\mathrm{STR}_1 = \frac{\sum w_{i,0} r_{i,1}}{\sum w_{i,0} r_{i,0}} = \frac{(1 \cdot 100 + 1 \cdot 150 + 1 \cdot 200)}{(1 \cdot 100 + 1 \cdot 100 + 1 \cdot 100)} = 1.5$$

$$\mathrm{LTR}_1 = \mathrm{STR}_1 \cdot \mathrm{LTR}_0 = 1.5 \cdot 100.0 = 150$$

$$\mathrm{STR}_2 = \frac{\sum w_{i,0} r_{i,2}}{\sum w_{i,0} r_{i1}} = \frac{(1 \cdot 100 + 1 \cdot 150 + 1 \cdot 100)}{(1 \cdot 100 + 1 \cdot 150 + 1 \cdot 200)} = 0.78$$

$$\mathrm{LTR}_2 = \mathrm{STR}_2 \cdot \mathrm{LTR}_1 = 0.78 \cdot 150.0 = 117.0$$

Linear interpolation

The second type of imputation used for the Import and Export Price Indexes is called linear interpolation. The method uses the price for the item in periods before and after the period or periods where the price is not reported to linearly interpolate the middle value or values. This type of imputation is most commonly used for industries characterized by heterogeneous items that are based more on company price factors rather than industry factors. Finished goods would generally fall into this category of items. Applying linear interpolation to the example in exhibit 4, the value of the missing price for the item in period 1 would be the midpoint of the item prices in period 0 and period 2. That example is illustrated in exhibit 6.

Exhibit 6. Linear Interpolation

Items	Element	Period 0	Period 1	Period 2
Item 1	Price	$10	$10	$10
	STR	1	1	1
	LTR	100	100	100
Item 2	Price	$20	$25	$30
	STR	1	1.25	1.2
	LTR	100	125	150
Item 3	Price	$5	$10	$5
	STR	1	2	0.5
	LTR	100	200	100

Note: STR stands for short-term relative. LTR stands for long-term relative.
Source: U.S. Bureau of Labor Statistics, International Price Program.

Again, once the missing price for item 2 in period 1 is imputed, the STR and LTR for the weight group can be derived.

$$\mathrm{STR}_1 = \frac{\sum w_{i,0} r_{i,1}}{\sum w_{i,0} r_{i,0}} = \frac{(1 \cdot 100 + 1 \cdot 125 + 1 \cdot 200)}{(1 \cdot 100 + 1 \cdot 100 + 1 \cdot 100)} = 1.42$$

$$\mathrm{LTR}_1 = \mathrm{STR}_1 \cdot \mathrm{LTR}_0 = 1.42 \cdot 100.0 = 142$$

$$\mathrm{STR}_2 = \frac{\sum w_{i,0} r_{i,2}}{\sum w_{i,0} r_{i,1}} = \frac{(1 \cdot 100 + 1 \cdot 150 + 1 \cdot 100)}{(1 \cdot 100 + 1 \cdot 125 + 1 \cdot 200)} = 0.82$$

$$\mathrm{LTR}_2 = \mathrm{STR}_2 \cdot \mathrm{LTR}_1 = 0.82 \cdot 142.0 = 116.4$$

With linear interpolation, in period 1, before the period 2 price is known, the item would initially be imputed using the cell mean methodology and then would be revised using the linear interpolation method once the next actual price was reported. The linear interpolation method is preferred because it uses the price for the same item. However, because the next available price is not present in many cases, the fallback is to use the cell mean imputation methodology. The linear interpolation method is available because the import and export price indexes

are revised in each of the three months after the indexes are first released. If no new price is received during the revision period, then the imputation is performed using the cell mean methodology.

Starting a series

The method for starting a price series in the Import and Export Price Indexes is known as initialization. This happens the month before the first price is received at initiation if that price is within the revision period when the item is initiated, and if not, the initialization happens the month before the first subsequent price is initiated. The technique is similar to the cell mean imputation technique used for missing prices. With initialization, the weight group LTR (if one is available) is used to start the series for an item. The regular cell mean imputation method is then used to fill in the missing STR.

Quality adjustment procedures and practices

Updates or modifications of a surveyed item sometimes affect the price or quality of the item. For example, a computer might be improved by adding more memory. The U.S. Import and Export Prices Indexes should reflect the pure price change in the index, not price changes because of changes in the quality of the item. If the effect of the modification on price can be reliably estimated, a quality-adjusted price is used. If the value of the modification cannot be reliably estimated, the item is no longer considered to be the same item, and a new item is substituted into the survey.

Industry analysts evaluate the magnitude and impact of the modification to each item in the survey when the description is changed by the respondent. The respondent may be consulted in making this determination. If the modification does not change the class, general function, or purpose of the item and the respondent can quantify the change in the item description or modification, then a ratio of the previous and current price is set for that period. The intent is to adjust the new price in terms of the previous price, excluding the quality change. Thus, the item's original price and subsequent prices will consistently reflect the original unmodified item, and the price change that is recorded for the item in each period will be solely the change in the market price. If the modification does change the item's class, general function, or purpose, or the value of the change cannot be quantified, then the item is deemed to be a new product. Then, item substitution is done by an industry analyst, which is discussed below, in the section on substitution procedures and practices.

For computers, hedonic modeling is used to estimate the value of the quality change when this information is not available from the company. The term "hedonics" applies to any regression analysis that breaks out the price of a product into separate price-determining characteristics. Many products can be modeled as a bundle of product characteristics, and a quality change represents a change in the quality of one or more of the characteristics. The cost of the quality change is estimated by deriving implicit prices for each characteristic, whenever the quality of any of the characteristics is altered.

The hedonic models are ordinary least squares (OLS) regressions that estimate implicit prices for various price-determining characteristics. The regression uses many prices of many computers with many characteristics, and the independent variable regression coefficients are the estimated price change for a one-unit change in each price-determining characteristic. When a price change occurs for a computer and is due to a change in the

characteristics of the model, the coefficient of the characteristic in the hedonic model is multiplied by the change in the characteristic to calculate the quality adjustment. This is the value of the quality adjustment, or VQA.

The general functional form of the hedonic model is shown in the equation below.

$$P_i = \beta_0 + \sum_{j=1}^{n} \beta_j x_{ij} + \varepsilon_i$$

where

$P_i =$ the price of good *i*,

$\beta_0 =$ the constant term in the OLS regression,

$x_{ij} =$ characteristic *j* for good *i*,

$\beta_j =$ the coefficient on characteristic *j*, and

$\varepsilon_i =$ a random error term that is assumed to have a normal distribution with a mean of 0 and a standard deviation equal to σ^2.

The constant term represents the base price. The coefficients are the implicit prices of the various characteristics. Price-determining characteristics may be modeled as continuous, discrete, or dummy variables.

Once the value of the quality adjustment is calculated, a link price is derived by taking the price of the new product in the current period and subtracting the value of the quality adjustment. Procedurally, the link price represents the value of the previous product in the current period (period 1). The period 1 STR is calculated as the percent change of the link price in period 1 to the price of the previous product in period 0. In period 2, the short-term relative is the change in the market price of the updated product from period 1 to period 2. Recall that only the price change is used in calculating price indexes. The different price levels between the previous product and the updated product are not used to calculate the price change. The advantage to this method is that the link price is being set in the period during which the quality adjustment takes place.

Substitution procedures and practices

Item substitution is the replacement of a previously traded item with a new item from the same company and within the same commodity classification group. The previously priced item is discontinued because the item is no longer traded, or a change in item description is not quantifiable. In the month that the one-to-one replacement occurs, there is no short-term price ratio for either the discontinued or the new item. The new item will get a price ratio the next month once two prices are collected.

Reweighting and rebasing

The U.S. Import and Export Price Indexes are reweighted annually due to changing patterns of trade. The weights used in the Lasperyes formula are the trade weights reported by the Census Bureau. These weights have a 2-year lag when annual trade data become available and applied to the indexes. For example, the weights for the indexes in 2019 are based on the import and export trade weights from the 2017 calendar year.

The best way to illustrate the need for annual reweighting is to give an example of the changing dollar values between weight years. In 2013, the petroleum area consisted of 12.6 percent of the total import trade dollar value in the import price indexes. By 2014, petroleum fell to 6.9 percent of the total import trade dollar value for the import price indexes, exhibiting a relatively sizable drop in value. If the indexes had not been reweighted on an annual basis, petroleum would have been overrepresented in the overall import price indexes.

To represent the least-biased weight of the Import and Export Price Indexes based on the trade value, the indexes need to be rebased to 100 for the weight year. The reason is that the relative weights or importance over time is based both on the fixed trade weights and the relative movement of the indexes as prices change. Indexes that fall at a relatively faster pace than other indexes have a smaller index value and will have less relative importance in the indexes.

Rebasing the published indexes on an annual basis rather than holding the base period constant makes the indexes less user friendly for those who track the index value from month to month. Indexes continuously published since 2000 have a fixed base period set equal to 2000 = 100. For indexes published subsequent to 2000, the index is based at 100 in the initial month of publication. In order to adjust the base year for usability, indexes are first rebased to the weight year. They are then calculated to update the index values for the current month and three revision periods. Next, the indexes are subsequently rebased back to 2000 = 100 or to the first publication month = 100 for indexes published after 2000.

Seasonal adjustment

None of the import and export price indexes are seasonally adjusted. International trade happens worldwide with most items available regardless of the time of year. There is insufficient evidence for seasonality in import and export prices, although there is potentially seasonality in quantities which annual weights do not account for on a monthly basis. An effective method for eliminating seasonality is to look at the rolling 12-month percent changes rather than monthly percentage changes.

Variance estimates

Sampling variability results whenever a sample is used rather than the complete universe. Currently, standard errors are published on an annual basis for the all-import and all-export price indexes. (See Variance Estimates for Price Changes in the Import and Export Price Indexes January–December 2018). For each month in the previous calendar year, the standard error is available for the 1-month, 3-month, and 12-month percent changes. The standard error, the square root of the estimated variance, is a common measure used to derive confidence

intervals for percent changes in the U.S. Import and Export Price Indexes. Confidence intervals can be used to determine if an index change is significantly different than zero.

Sources of error

There are different types of errors that are introduced when calculating the U.S. Import and Export Price Indexes. One way to look at measurements of error is the difference between sampling error and nonsampling error. Sampling error is the error resulting from drawing a sample of imported and exported items to and from the United States, rather than using the entire universe of trade.

Nonsampling error can take a number of different forms. One form is misspecification error, which takes place if the universe of data from which the sample is being drawn does not correctly measure the actual population. This type of error could result if the Census Bureau makes mistakes in measuring the trade dollar value statistics that BLS uses to construct their U.S. Import and Export Price Indexes. A second type of nonsampling error is nonresponse error. Each month, a subset of the items sampled do not have prices reported. This type of error results if the respondents and nonrespondents do not represent a similar cross section of the total universe. Another form of nonsampling error can be introduced from misreported prices.

One issue when deriving an estimate from a sample is the potential trade-off between variance and bias. Variance is a measure of how much the estimates derived from numerous samples differ from the true value of the estimate. Bias results when the expected value of the estimate is either higher or lower than the true value of what is being estimated. An estimate could have a high sampling variance and still be unbiased if the expected value of the estimate is equal to the true value. Likewise, an estimate may have small variation over numerous samples, yet be biased if the expected value of the estimate deviates from the true value.

BLS strives to minimize both sampling and nonsampling error as much as possible. Sampling error is reduced by maintaining as many prices as possible to support an index, given resource and company burden constraints. Nonsampling error is reduced by subjecting the data to careful review using automated checks and a staff of professional economists, as well as by employing methods to estimate missing observations.

Replication and variance estimation

To derive the standard error, a modified bootstrap method, applying rescaled sampling weights, is used to produce 150 replicate index set estimates from 150 simulated item set samples. Item set replicates are constructed according to IPP's 3-stage sample design. At both of the first two stages of sampling, it is possible for a selection to be either a certainty selection (i.e., the probability of selection is greater than the iteratively calculated sampling interval) or a probability selection. The replicate resampling method takes this into consideration by first partitioning the selected items within each sampling stratum m into those items that resulted from certainty establishment selections and those items resulting from probability establishment selections. The item set resulting from establishment certainty selections is further partitioned into two item sets: sampling classification group certainty selections and sampling classification group probability selections.

Thus, the set of all sampled items S is the union of these three partitions over all sampling stratum m

$$S = \bigcup_{m=1}^{N} S_m = \bigcup_{m=1}^{N} \left(\bigcup_{p=1}^{3} S_{m_p} \right)$$

where

N = the number of sampling strata, $p \in \{1,2,3\}$,

p = 1 for items selected from probability establishments,

p = 2 for items selected from probability sampling classification groups within certainty establishments, and

p = 3 for items selected from certainty sampling classification groups within certainty establishments.

Each bootstrap sampling, *b*, selects $n_{m_p}^b$ units within each partition of each sampling stratum as follows:

$$n_{m_p}^b = \begin{Bmatrix} n_{m_p} - 1 & n_{m_p} > 1 \\ 1 & n_{m_p} = 1 \end{Bmatrix},$$

where

n_{m_p} = the number of units originally sampled in partition *p* of sampling stratum *m*.

Bootstrap item weights are then calculated as

$$w_{m_p,j,i}^b = \begin{Bmatrix} w_{m_p,j,i} \left(\dfrac{n_{m_p}^b + 1}{n_{m_p}^b} \right) d_{m_p,j}^b & \text{for } n_{m_p} > 1 \\ w_{m_p,j,i} & \text{for } n_{m_p} = 1 \end{Bmatrix}$$

where

$w_{m_p,j,i}^b$ = the bth replicate item weight for item *i*, within establishment *j* and sampling stratum partition m_p,

$w_{m_p,j,i}$ = the standard item weight for item *i*, within establishment *j* and sampling stratum partition m_p, and

$d^b_{m_p,j}$ = the number of times establishment *j* within partition *p* of sampling stratum *m*, is selected in bootstrap sample *b*

In the rare instances that $n_{m_p} = 1$, a simple random sample of items within that establishment is selected. If only one item exists under this establishment singleton, that item is chosen with certainty.

For each of the 150 bootstrap samples, chained indexes of the desired length are calculated at all levels of aggregation using these modified item weights, original probabilities of selection, trade dollar values, and collected price data. For variance estimates, the variance is calculated across replicate percent change values for all published indexes as

$$v_B = \frac{1}{150}\sum_{b=1}^{150}\left(\hat{\theta}_b - \hat{\theta}\right)^2$$

where

$\hat{\theta}$ is the full sample estimate.

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Presentation

BLS publishes hundreds of import and export price indexes every month. These include price indexes for aggregate merchandise goods, air freight and air passenger services, merchandise goods imports by locality of origin, merchandise goods exports by locality of destination, and U.S. terms of trade indexes by locality. Indexes are published by industry (North American Industry Classification System), by commodity area (harmonized system), and by end use (end use classification). In addition to regular index releases, publications include analysis articles and the data are used in scholarly studies and in the production of gross domestic product (GDP) and other official statistics.

Publications

The primary U.S. Import and Export publication is the monthly news release, which contains summary text, data tables, and a technical note. The summary text describes price movements and trends. The tables provide index values, relative importance values, monthly percent changes, and annual percent changes for corresponding price indexes. Lastly, the technical note at the end of the news release describes the classification systems and the methods used to calculate the U.S. Import and Export Price Indexes, the guidelines for price data collection, data revision policy, and uses of the data. In addition to the release, interactive charts are available that cover major import categories, major export categories, select import localities, export grains, and air passenger fares. Links to the LABSTAT database, which is a database that contains the complete set of available data, can be found on the home page as well.

Additional outputs that are updated monthly in tandem with the news release include the index and percent change tables, history tables, and percent change and analysis tables. Index and percent change tables are formatted like the data tables included in the release and comprise all published price index data for each classification system. The detail includes import and export index data at the five-digit level under the Bureau of Economic Analysis (BEA) end-use classification, the six-digit level under the NAICS classification, and the four-digit level under the harmonized classification. Starting in 2019, indexes are published for commodity areas with at least $4.76 billion in annual import or export trade value. Some exceptions are made for published BEA end-use indexes that fall below the minimum dollar value yet remain statistically robust because of their importance in deflating the net exports component of GDP. Commodity areas with smaller dollar values are incorporated into the calculation of higher level indexes, but typically are not published separately. The history tables display the index values for all published index series for all months each series is published.

Lastly, the percent change and analysis tables provide the most complete set of historical data that BLS makes available for a particular import or export price index. These tables are published for

- all imports
- all exports
- each of the end-use classification indexes at the one-digit level of aggregation
- the import price indexes aggregated by locality of origin

- the export price indexes aggregated by locality of destination
- U.S. terms of trade indexes by locality
- advanced technology product indexes
- select major merchandise goods indexes.

Index values may be revised up to 3 months following the initial release. The data displayed in the percent change and analysis tables are the index values, monthly percent changes, quarterly percent changes, and 12-month percent changes for every month that this select group of indexes has been published.

Other publications produced by IPP analyze specific indexes and aspects of the U.S. economy. Some of these publications review how the U.S. Import and Export Price Indexes relate to particular industries, regional areas, and uses, while others provide a comprehensive background and study regarding an area of interest. Industry pamphlets review the performance of a particular industry's corresponding U.S. Import and Export Price Indexes, which factors played a role in the index movement, and which states were involved in that industry. Regional pamphlets observe the movements of specific export indexes related to a state's or U.S. region's main exporting industries. The contract escalation pamphlet takes a detailed look at how U.S. Import and Export Price Indexes can be used for that purpose. The Variance Estimates for Price Changes in the Import and Export Price Indexes January–December 2018 provide variance statistics for select indexes. Information and tables are available on the comparability of import prices to their PPI counterparts. Monthly Labor Review (MLR) and Beyond the Numbers articles examine more comprehensive economic issues. These articles could include a historical piece involving a highly traded commodity, or an in-depth study about how international prices compared with other economic indicators. In addition, several external academic papers used U.S. Import and Export Price Indexes data for exchange rate studies, as well as industry-specific studies of imports or exports. Information is also available for import and export survey respondents who provide the data to BLS that are used to calculate indexes.

All publications, as well as links to academic papers that reference import and export pricing data, can be found on the MXP home page. Users may also subscribe to receive a monthly email that is sent whenever the U.S. Import and Export Price Indexes are updated by clicking "BLS News Service Subscription Page" in the box labeled *MXP Contacts* at the bottom of the U.S. Import and Export Price Indexes home page.

Uses for the U.S. Import and Export Price Indexes

The U.S. Import and Export Price Indexes have many uses and users. What follows are some illustrative examples of the uses of these statistics.

Adjusting foreign trade statistics

Data from the U.S. Import and Export Price Indexes are used to adjust U.S. Government foreign trade statistics for price level changes. Produced by the BEA, the National Income and Product Accounts (NIPA) contain a net export component that is real exports minus real imports. Following are the basic formulas for deriving GDP and real imports:

$$\text{GDP} = C + I + G + (X - M)$$

where

C = real consumption,

I = real investment,

G = real government spending,

X = real exports, and

M = real imports.

Import and export price index data are used by the BEA to revise the nominal import and nominal export values in order to obtain their real values:

$$M = {}^{m}/_{p}$$

where

M = real imports,

m = nominal imports, and

p = the price index for imports.

Depending on the movement of the indexes, an import's nominal value could be more or less than its real value. The same is true for exports. NIPA are not the only government statistics produced using import and export price data to deflate certain components. The Census Bureau uses import and export price indexes to deflate its monthly foreign trade statistics. In general, the U.S. Import and Export Price Indexes can be used to deflate any type of import or export volume statistic into real terms. For example, a company that exports raw cotton might keep a measure of its sales in current dollar terms. In order to report the real value of sales to stockholders, the company needs a method to convert sales values into constant dollars. The company would be able to make this conversion by deflating sales statistics using the export price index for raw cotton. Any of the U.S. Import and Export Price Indexes can be used for deflation purposes, provided the data being deflated use a similar definition for an import or an export as is used for the U.S. Import and Export Price Indexes.

Contract adjustment

Other ways to use the U.S. Import and Export Price Indexes data include contract adjustment and trade agreement negotiation. Many economic transactions are formalized with contracts. Sometimes a business or government agency needs to ensure that the payment for some output or input is equal in real terms to what was desired when

the contract was signed. A specific import or export price index can be used to equate a dollar amount in the future with a specific dollar amount at the time of signing. Government agencies that have used the data in negotiating trade contracts include the Department of State, the Department of Commerce, and the office of the U.S. Trade Representative.

Examining currency exchange rate effects

Exchange rates play a vital role in the pricing of imports and exports. Data users can use U.S. Import and Export Price Indexes in a number of ways to analyze the effects that exchange rates have on the economy. The first method is to construct an import or export price index expressed in foreign currency terms. To do this, users can take country of origin or destination weights in an item area, obtained through the Census Bureau, and then calculate a geometric average of the exchange rates between the respective currencies and the U.S. dollar. Users can derive foreign currency indexes by multiplying the average exchange rate indexes by the corresponding U.S. dollar import or export price index. Another method is to examine pass-through rates by comparing the U.S. dollar's movements against other currencies and the movements of the U.S. Import and Export Price Indexes. For example, if the U.S. dollar appreciates against foreign currencies, the price of U.S. exports (in foreign currency) should rise, while the price of U.S. imports would be expected to fall.

Price elasticity

The U.S. Import and Export Price Indexes are also a valuable input to price and income elasticity studies. Import and export price elasticities are the percentage changes in the volume of trade resulting from percentage changes in trade prices relative to domestic prices. Income elasticities measure how levels of imports and exports are affected by changes in the real value of national income, measured by the growth in GDP. They are calculated by dividing the percentage change in either the volume of imports or exports by the percentage change in GDP over the same period.

Informing monetary and fiscal policy

Forecasting future prices and formulating monetary and fiscal policy are common uses of U.S. Import and Export Price Indexes data. Often, movement in import prices can be an indicator of future inflation because many inputs to domestic production are imported. Import and export prices affect the general level of inflation in the United States, considering import and export products compete, through pricing, with the domestic market. Whether attempting to gauge future inflation or analyze some other aspect of international trade, those who formulate monetary and fiscal policy also consider import and export prices when determining a course of action. The Federal Reserve Board of Governors looks at import and export prices as one of the economic indicators in the myriad of data used in their decision making.

There are many other ways U.S. Import and Export Price Index data are used in studies and decision making. Researchers wanting access to nonpublic import- and export-price-related microdata must submit an application following the criteria posted on the BLS visiting researchers' webpage. Once approved, researchers may access the data for 1 to 2 years onsite at the BLS national office in Washington, D.C.

Revision policy

The U.S. Import and Export Price Indexes are revised for each of the 3 months following the initial publication of the data in order to reflect late-reported prices and correction by respondents. After the 3-month revision period, no further revisions take place. For example, data published with the January release will be subject to revision in the February, March, and April releases.

Data correction

If an error is discovered in any published data product for the U.S. Import and Export Price Indexes, the publication is corrected and republished as soon as possible. In the event that any error cannot be corrected prior to the next data release, the erroneous data will be suppressed. Any corrections or suppressions are clearly noted on the publication as well as on the public web page. In addition, a record of the error is added to the BLS errata page.

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History

Key developments

- **1886:** The original charter for the Bureau of Labor Statistics (BLS) included a goal to provide prices of imported goods in the United States and other countries.
- **1889:** For the first time, BLS published a report comparing U.S prices with those in Great Britain, Germany, France, and Italy.
- **1919:** The Census Bureau began producing unit-value import and export price indexes.
- **1946:** BLS fielded a pilot study to provide import price indexes, but the pilot was cut in 1948 due to a 50-percent cut in the BLS Budget.
- **1961:** The Stigler report recommended that BLS take the responsibility for putting out detailed import and export price indexes..[1]
- **1971:** The International Price Program (IPP) was established to produce import and export price indexes.
- **1973:** BLS published first annual U.S. Import and Export Price Indexes.
- **1974:** Started quarterly collection and publication of select import and export price indexes.
- **1976:** Probability sampling technique was implemented.
- **1982:** U.S. Import and Export Price Indexes were placed on list of principal federal economic indicators by the Office of Management and Budget (OMB).
- **1983:** First all-goods import price index was published quarterly.
- **1984:** First all-goods export price index was published quarterly.
- **1986:** Released first price index for select services on a quarterly basis.
- **1989:** Began publishing select price indexes on a monthly basis.
- **1989:** Panel-sampling method that split imports and exports and created a 2-year continuously collected sample frame first was used for the publication of U.S. Import and Export Price Indexes.
- **1992:** Began publishing price indexes using harmonized classifications at the product level.
- **1992:** IPP published import price indexes for select countries and regions (locality of origin indexes) for the first time.
- **1993:** Most indexes for merchandise goods began publication on a monthly basis.
- **2001:** Started providing monthly publications for select services.
- **2004:** Annual reweighting was introduced. Prior to that, the indexes were reweighted every 5 years.
- **2004:** Began web-repricing data collection to survey respondents.
- **2005:** Began publishing price indexes using NAICS classifications at the industry level.
- **2005:** Expanded country and region coverage of locality of origin import price indexes.
- **2012:** Expanded detailed industry coverage of locality of origin import price indexes.
- **2018:** Published export price indexes for select countries and regions (locality of destination indexes).
- **2018:** Published U.S. terms of trade indexes for select countries and regions.

Although import price indexes were not established in 1889, efforts were made to compare prices with selected countries over the years, and by 1973, the International Price Program (IPP) published the first annual report on U.S. Import and Export Price Indexes.

In 1961, a report on federal price statistics was prepared by the National Bureau of Economic Research (NBER) for Congress' Joint Economic Committee. The report suggested that responsibility for compiling import and export price indexes be assigned to a federal statistical agency “to obtain the attention and resources for these indexes

that we believe are essential." Until the IPP was established at the Bureau of Labor Statistics (BLS), the only measure of price trends in U.S. trade was the unit-value indexes produced by the Census Bureau, which did not provide the precision needed. The unit value indexes were calculated at fairly broad levels meaning some items included in calculation were heterogeneous. Unit-value bias arises when there is no way to determine if changes to the indexes are the result of true price changes or changes to the mix of items. In addition, unit-value indexes do not take into account quality changes which also distort the measure of true price change. An additional study undertaken for NBER, by professors Irving Kravis and Robert Lipsey, gave more impetus to the project. In the study, "Price Competitiveness in World Trade," Kravis and Lipsey outlined the need for such measures and the feasibility of producing them. During this time, the BLS Division of Price and Index Number Research, because of its expertise in developing other price measures, had also begun research on the feasibility of producing import and export price indexes. IPP, a natural result of this research, was established in 1971.

Early stages

The newly created IPP first produced annual U.S. Import and Export Price Indexes in 1973. As a response to changing international economic conditions and the need for both the federal government and the private sector to obtain these data on a timelier basis, the program began quarterly collection of price data and publication of U.S. Import and Export Price Indexes in 1974. This also allowed the indexes to be used in deflation of the quarterly gross domestic product estimates produced by the Bureau of Economic Analysis. Commodity area coverage and index detail increased as more samples were initiated. This expansion attempted to meet the needs of users while moving toward the goal of producing indexes that covered all merchandise goods. In early 1983, the first general index for all imports was published for the quarter ended December 1982. An index for all exports was published in early 1984 for the December 1983 quarter.

The earliest import and export price samples were based on a subjective selection of establishments and items whose price movements were considered representative. A multi-stage design was used to select up-to-date specific import and export items that could be priced over time. IPP initiated a probability sampling technique for the first two stages in 1976 and for the subsequent stages in 1982. To maximize productivity, efforts were made to ensure that frequent importers and exporters make up approximately 99 percent of each sample.

Improvements and expanding indexes

In 1982, once full coverage of import and export merchandise goods categories was available, the Office of Management and Budget (OMB) placed the U.S. Import and Export Price Indexes on the existing list of principal federal economic indicators (PFEI) joining the Consumer Price Index and Producer Price Index.

The U.S. Import and Export Price Indexes continued to expand with the publication of selected import and export services price indexes beginning with the first quarter of 1986 (export air passenger fares). Since then, price indexes have been added for additional import and export services, but due to budget cuts in 2007, price indexes for import oil tanker freight, import ocean liner freight, export post-secondary education, and export travel and tourism were discontinued.

In 1989, the import and export merchandise goods universes used in the calculation of the indexes were divided into halves. Samples for one import half and one export half are fielded each year, so that both universes are fully resampled every 2 years. Sampled items are priced for approximately 5 years until they are replaced by a fresh sample of the same half-universe. Generally, each index is composed of at least two samples for each half of the import and export merchandise goods universes.

Also in 1989, the publication of a limited number of indexes on a monthly basis was initiated. This was done primarily to permit the Census Bureau to publish monthly merchandise goods trade statistics on an inflation-adjusted basis. By January 1993, most of the merchandise goods indexes were being published on a monthly basis.

With the release of March 1992 data, import locality of origin indexes were first published. In 2005, locality of origin monthly publications were expanded, adding six more countries and regions. The locality of origin indexes expanded again in 2012, when additional industries were included for select countries and regions.

Most recently, in 2018, export locality of destination indexes and U.S. terms of trade indexes by locality were published for the first time. The indexes were retroactively published back to December 2017. In addition, tables comparing import price indexes with their respective PPI counterparts were introduced.

NOTES

[1] Dorothy S. Brady, Edward F. Denison, Irving B. Kravis, Philip J. McCarthy, Albert Rees, Richard Ruggles, Boris C. Swerling, George J. Stigler, *The Price Statistics of the Federal Government: Review, Appraisal, and Recommendations*, National Bureau of Economic Research, 1961, https://babel.hathitrust.org/cgi/pt?id=mdp.39015048453024&view=1up&seq=80.

Archives

- August 20, 1997

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More Information

Additional information on the U.S. Import and Export Price Index Survey (MXPI) is available on the Bureau of Labor Statistics website: www.bls.gov/mxp.

MXPIs are available on the BLS website:

- Time series data from the MXPI database: www.bls.gov/mxp/data
- Latest news releases: www.bls.gov/news.release

For a listing of frequently asked questions, see www.bls.gov/mxp/ippfaq.

For more information on measures of U.S. price competitiveness, see www.bls.gov/mxp/home.htm#measures.

For more information for BLS import and export price respondents, see www.bls.gov/respondents/mxp.

For more information for visiting researchers using BLS import and export price data, see www.bls.gov/mxp/visitingresearchers.

Selected articles on U.S. Import and Export Price Indexes are referenced below.

Methodology:

- "Imputation and Price Indexes: Theory and Evidence from the International Price Program," 2001
- "Are producer prices good proxies for export prices?," 1997
- "Using Disaggregated Data to Dissect the U.S. Trade Deficit ," 1995

Using Administrative Data to Derive Import and Export Price Data:

- "Unit Values for Import and Export Price Indexes - A Proof of Concept," 2019
- "Measuring Export Price Movements with Administrative Trade Data," 2019

Transfer Prices:

- "Transfer Pricing, Intrafirm Trade and the BLS International Price Program," 2001
- "The Behavior of Intrafirm Trade Prices in U.S. International Price Data," 2001

The Office of Prices and Living Conditions, Division of International Prices, will be glad to assist you with questions about the MXPI.

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