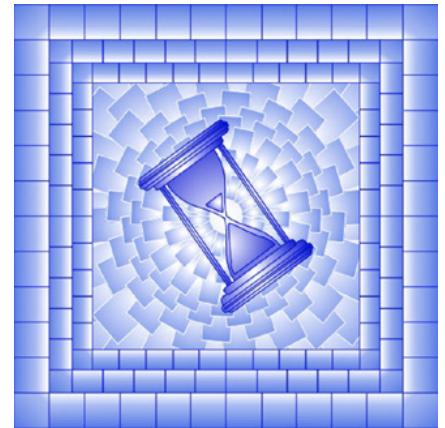


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Technical Guide for the Freight Rail Services Price Index (FRSPI)



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Technical Guide for the Freight Rail Services Price Index (FRSPI)

1 Introduction

The Freight Rail Services Price Index (FRSPI) measures the monthly and the quarterly changes in the shipment price of certain commodities in Canada. The freight rail sector is classified under the Mainline freight rail transportation, North American Industry Classification System (NAICS) 482113. The FRSPI is an important indicator of economic activity within the freight rail services industry, as well as a tool for performance evaluation, cost monitoring, contract assessment and benchmark comparisons. It is also used by the Canadian System of Macroeconomic Accounts (CMSA) to calculate the real value added for the industry and to measure changes in productivity.

For the purpose of the FRSPI, freight rail services are classified into one of the seven commodity groups:

- Automotive
- Coal
- Forest products
- Grain and fertilizer
- Intermodal
- Metals and minerals
- Petroleum and chemicals

These commodity groups used by the rail industry were selected based on the top commodities shipped in Canada based on revenue.

The FRSPI is an aggregation of these seven commodity groups. The industry comprises of establishments primarily engaged in operating railways for the transport of goods over a mainline rail network, with origin-destination pairs across Canada and the US.

Appendix A defines key concepts used for constructing the FRSPI.

2 Data Sources

The data used to produce the FRSPI is obtained through companies' websites and other administrative sources. One of the main data sources is published tariffs, which are collected online. Data collection for the FRSPI occurs on the second Monday of the reference month.

Indexes are published at the national level for each commodity group and for the overall aggregated FRSPI.

2.1 Sampling Process

Cut-off sampling is used to create the sampling frame for the FRSPI. The cut-off sampling selection is obtained from the list of enterprises listed on Statistics Canada's Business Register (BR) that are classified to the NAICS 482113. The target population for this survey consists of all Canadian businesses that provide rail services for the delivery of commodities.

The sample only covers Class I carriers, which comprises of railway companies that realized gross revenues of at least \$250 million for the provision of Canadian rail services, in each of the two calendar years preceding the year in which information is provided pursuant to the Carriers Information Regulations. Using this data, a matrix of origin and destination was built for each of the 7 commodity groups based on total tons transported. Based on the matrix results the top 10 origins and destinations by total tons carried were selected for shipments for each commodity group.

2.2 Prices

For the purpose of the FRSPI, prices are defined as the amount charged by carriers for delivering a carload of a certain type of commodity and of a specific weight on a specific distance (specific origin and destination) and under certain terms of shipment.

Table 1
Definition of Shipment Price for the FRSPI

Origin	Destination	Product Shipped	Equipment	Specific Terms
Calgary	Toronto	Wheat	Covered Hopper	Maximum 100 Tons

Price quotes are collected monthly from companies' websites. For monthly collection cycle, base tariff rates and applicable fuel surcharges (mileage or percentage based) are obtained for selected origin-destination pairs across Canada and U.S. for predetermined commodity groups. The distance between all origin-destination pairs is provided by official railway maps and a third party software.

These collected prices are used to compute a final price by origin-destination. If applicable, the final price by origin-destination in US dollar is converted to Canadian dollar using the Bank of Canada monthly average exchange rate.

The FRSPI survey aims to track the same shipments over time to maintain continuity in the price index; however, service substitutions do occur periodically if shipments are updated or become discontinued. To minimize the number of breaks in the series, price movements resulting from service changes are researched and validated so that services deemed comparable are accepted into the index calculation. A service is deemed "comparable" to the old one if it serves the same function, has similar characteristics and prices, and serves the same niche market. Price movements that arise from non-comparable service substitutions are excluded.

In any given period, prices for a specific origin-destination pair may not be available for collection. In such cases, the missing prices are imputed using the average price movement of non-missing data within the same commodity group or the average price movement of remaining commodity groups within the same company.

2.2.1 Outliers

The FRSPI excludes outliers from calculation if there is reason to believe that the reported prices do not accurately represent a service's pure price movement. Outlier prices are not representative of typical industry movement and, if left untreated, may disproportionately drive up or down the index.

Outlier treatment is subject to analyst's judgment, on a case-by-case basis, and takes services' historical trends and industry trends into account. For certain volatile industries and services, more extreme movement is a regular occurrence and may not disrupt historical trends. For others such as those whose prices are less than a dollar or whose prices rarely change month-over-month, small movement can create large spikes in the index.

2.3 Revisions

With each data release, data for the previous month may have been revised. These revisions take place when data collection is delayed for a previously missing data point. The monthly and quarterly series are also subject to an annual revision with the release of the second quarter data of the following reference year. The indexes are not seasonally adjusted.

This revision period exists so that respondents can edit their price data for the previous month. This is conducive to price data quality as respondents may make corrections to their data, as in cases of input errors or revisions and audits of their prices.

2.4 Weights

The FRSPI is calculated as a weighted average of the price change of freight rail services in Canada. The weights are designed to capture the relative importance of the companies and commodity groups as measured by their

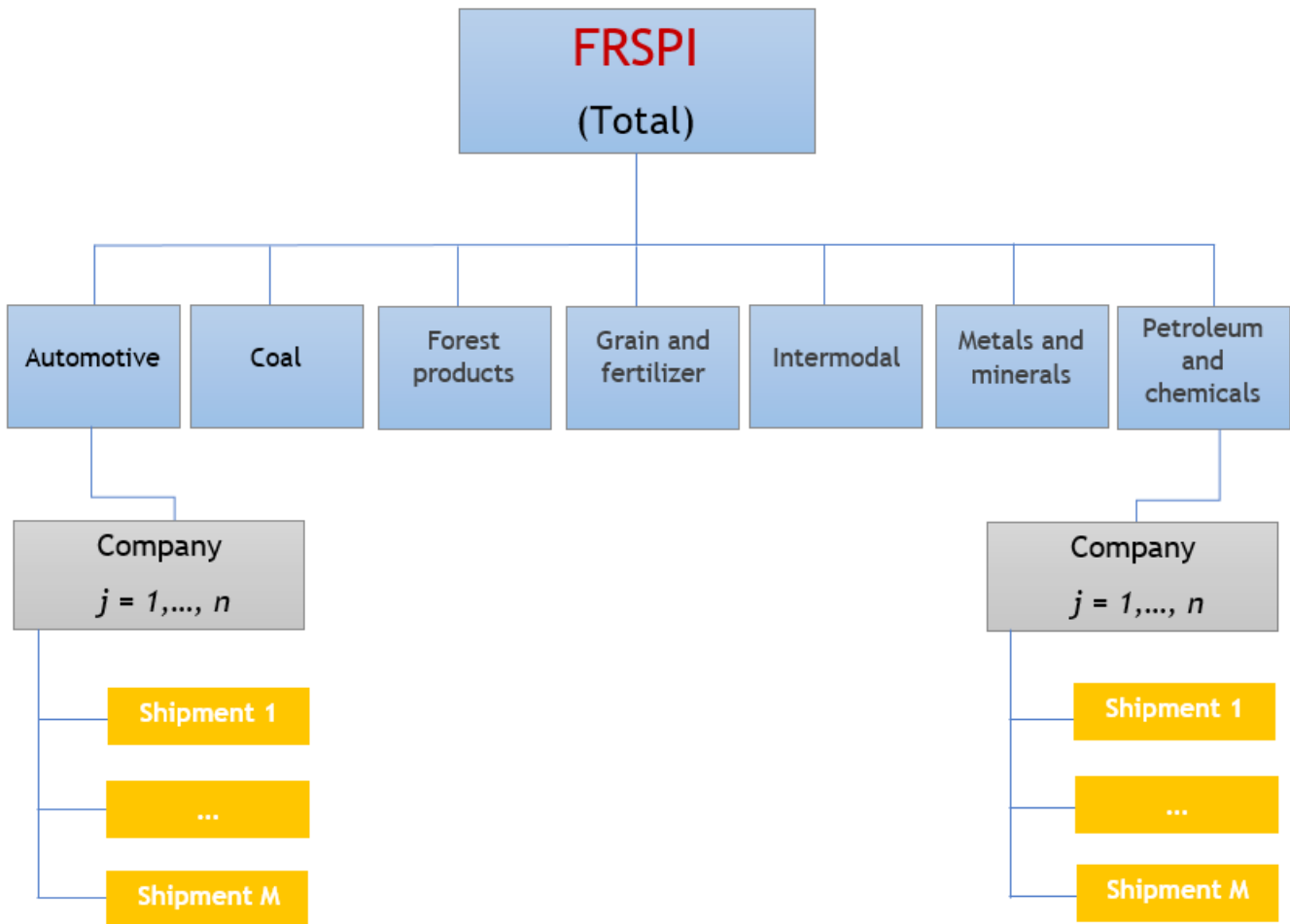
revenue shares. The overall impact of a price change of a commodity group or company on the total index is determined by its weight value. The weights used for the FRSPI are derived from the revenue data reported in financial statements of the sampling units and the Statistics Canada’s Annual Survey on Rail Transportation. An average of 3 years of revenue is used to calculate the weights in order to mitigate the impact of any abnormal economic event in a unique year.

The total FRSPI is aggregated using the sum of revenues for each company under each commodity group. The share of total revenue of each commodity group in the sample is assumed to be representative of the true share for each commodity group in the population.

3 Aggregation Structure

For the FRSPI, companies are classified into each of the 7 commodity groups. Figure 1 presents the aggregation structure from the elementary aggregates at the company level up to the total FRSPI.

Figure 1 Overview of Aggregation Structure for the FRSPI



The lowest level of aggregation consists of performing an unweighted geometric average of price relatives (Jevons index) at the company level to form company elementary aggregates. The resulting aggregates are aggregated within the commodity groups using weights to form commodity group indexes which are then combined to form the total FRSPI using a weighted arithmetic average.

4 Index Estimation and Aggregation

4.1 Introduction

The FRSPI is based on a fixed sample, where monthly price changes for a fixed basket of services are measured over time. The FRSPI is calculated for the current period and compared to the previous period to measure changes in prices. Estimates are produced by calculating a weighted average of price relatives by commodity group, which are chained together to form an index series. The FRSPI is a fixed base Laspeyres chain linked index, available at the national level only.

4.2 Calculation of elementary aggregates

At the lowest level, the price relatives are aggregated using an unweighted geometric average of shipments in each company to produce a price index by commodity group for each company. These first stage aggregations are referred to as elementary price indices, and are at the company level.

The monthly index for company j in commodity group i is given by:

$$EA_{ij}^t = \prod_{m=1}^M \left(\frac{P_{ijm}^t}{P_{ijm}^{t-1}} \right)^{1/M} \quad \text{for } t \geq 1$$

EA_{ij}^t : The elementary aggregate of company j in commodity group i at time t .

P_{ijm}^t : The price of shipping service m for company j in commodity group i at time t .

4.3 Compilation of upper level aggregated indexes

The elementary price indexes are aggregated across companies within each commodity group using a weighted arithmetic Laspeyres index.

The monthly index for commodity group i is given by:

$$I_i^t = I_i^{t-1} \sum_j \left[(EA_{ij}^t) w_{ij}^t \right] \quad \text{for } t \geq 1$$

where

$$w_{ij}^1 = w_{ij}^0$$

$$w_{ij}^t = \frac{(EA_{ij}^{t-1}) w_{ij}^{t-1}}{\sum_j [(EA_{ij}^{t-1}) w_{ij}^{t-1}]} \quad \text{for } t \geq 2$$

I_i^t : The index for commodity group i at time t .

w_{ij}^t : The price updated weight of company j in commodity group i in period t .

w_{ij}^0 : The base weights of company j in commodity group i . These are also the starting weights used at time 0.

The above price index is then aggregated across all commodity groups to produce the total FRSPI.

The monthly total FRSPI is calculated as follows:

$$I_T^t = I_T^{t-1} \sum_i \left[(I_i^t) w_i^t \right] \quad \text{for } t \geq 1$$

I_T^t : The overall price index for freight rails industry at time t .

W_i^t : The price updated weight of commodity group i in period t .

The quarterly index is the average index value of the three months within a given quarter. The index is calculated using the following formula:

$$I^q = \frac{1}{3} \sum_{t=s}^{s+2} I_T^t$$

I^q : The quarterly price index for freight rails industry.

4.4 Basket Updates

Revenue weights of the sampling units are updated on a regular basis to better represent current economic activity. For the FRSPI, this occurs every 5 years. Basket updates consist of revising revenue weights and the sample of companies by adding or removing units to ensure the sample is representative of the population.

With the introduction of a new basket, historical estimates are linked to the new basket by maintaining the same historical monthly changes. This is achieved by multiplying each element of the old index series by a link factor, which is calculated as the ratio of the new index value to the old index value in the overlap period. This chain-linking process ensures that period-over-period changes in the index only reflect price movements.

Appendix A

Concepts and definitions for FRSPI

Concept	Definition
Base period	The period for which the index equals 100. The base period for the FRSPI is 2018.
Company	The lowest level organizational unit for which financial statements are maintained.
Fuel surcharge	An extra fee charged per shipment based on the market fuel prices. Typically, fuel surcharge is added to the base rate.
Mainline rail network	A system that comprises of one or more trunk lines into which a network of branch lines feed.
Price	The dollar amount invoiced to a client for a particular shipping service inclusive of fuel surcharge, but exclusive of taxes and other charges.
Shipment	A combination of a carrier transporting a certain type of commodity on a specific route under certain terms of shipping.
Target population	All businesses in Canada that engage in the provision and sale of freight rail services.