NFI

NATIONAL FREIGHT INDEX

Powered by RIVIGO

Unlocking USD 12 billion opportunity in road freight marketplace through a trustworthy Price Exchange and Index

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Executive Summary

In 2018, the Indian road freight market was estimated to be at USD 150-160 bn. About USD 130-140 bn of this is the full truck load market and within this, the spot freight market is about USD 110-130 bn. The spot freight market is growing at 9-10% per year compared to the overall GDP growth rate of 7%. The spot freight marketplace comprises four major actor groups.

- End customers or shippers, who provide loads
- Transporters, who assume the operational and financial risk while moving goods
- Brokers, who help match demand and supply
- Fleet owners or carriers, who engage their owned trucks for goods movement

Marketplace efficiency is directly proportional to the number of active players on both sides of the fence. Shippers typically publish loading plans a day in advance to transporters. Transporters, and sometimes shippers themselves, reach out to brokers, to place trucks within price and time-based constraints. The general expectation is a confirmation on truck details within 1-3 hours of request, even if the loading is scheduled many hours away. The broker, who typically engages with 5-15 players on demand and supply sides, finds matches for the load.

This model increases uncertainty and risk for both sides. While waiting longer gives time to negotiate better rates, it also increases the chances the load or truck will get booked by the time a satisfactory price is found, as each spot order comes with an urgency. Fleet owners and transporters need to engage with multiple brokers or work with sub-optimal prices. The need to network with more brokers is even more pressing for fleet owners with less than 5 trucks (75% of truck owners are in this category).

As a result, the entire marketplace becomes a collection of close-walled mini-marketplaces of tens of players where no single party can stake claim to know the best estimate of count of available loads and trucks, either party's willingness to pay and spot rates across more than a few lanes.

The traditional marketplace has been effective majorly due to lack of a better alternative. It works, but with inefficiencies. The transaction costs in this 'traditional' marketplace, including brokerage, inventory and fleet underutilization are about USD 8-16 bn per year, which is about 7-14% of the total marketplace size.

The information asymmetry of location pair and vehicle type is a deterrent to creation of a composite index, which could reflect the performance of the spot freight market in the country. Information is disparate with low refresh frequency, disseminated only with press releases, limited to few key lanes, marred with lack of specificity and gathered through select sources where the risk of a sampling bias is high.

The industry needs a two-pronged solution. First, a digital freight rate exchange which reflects the transaction prices across millions of lanes in the country. Second, a freight index which

aggregates the prices in a meaningful way to reflect the trends in spot rates at acceptable levels of granularity. The industry an equivalent of a stock market such as NSE as well as a stock-price-based index such as NIFTY is necessary.

Trustworthy indices worldwide have clear markers. They **transparently** reflect the underlying logic and the logic remains **consistent** over a period of time. The data on which they are based has high **credibility** as they are more of actual transactions and less of imputations. The indices are **updated regularly** at a stated frequency. The indices cover the market segments **comprehensively** and often come with **granular** decomposed sub-indices to reflect micro-segments. Each micro-segment is **well represented** through appropriate sampling and weighting. There is a **universal appeal** to how indices are projected and interpreted across countries and user groups, which makes them compliant and **scalable** for a variety of use cases.

With these rationales and accompanying design principles, the Rivigo Rate Exchange (RRE) was created. Further, the National Freight Index (NFI) has been launched based on the prices reflected in the exchange. While RRE gives a live spot rate on over 7 million lanes (origin, destination) and vehicle type combinations in the country, the NFI is a barometer of the road freight spot market, offering an aggregated picture of both, live rates and historical trends of spot prices across 150 different combinations.

On the page nationalfreightindex.co.in, one can look at the live freight index across adjustable filters on truck types, origin zones and haulage distance and lane-wise live spot rates. Additionally, a 13-month index history, a dedicated page on insights generated from indices, and a 6-month price history for top lanes are also available. Over the next few months, new features will be launched to enable index personalization and reflect market mood live.

NFI can cater to use cases for logistics decision makers, researchers, sales force of trucking related businesses (OEMs, NBFCs), researchers, academicians and students. One can use the indices in conjunction with their own data points or refer to the insights generated by the NFI team. Below are some interesting and useful insights

- Container truck indices are more sensitive to fuel price variation vs Open truck indices.
- Using indices and fuel prices one can infer that fleet owner profitability took a hit in Q3 FY19 and is recovering now.
- Inflation indices (CPI, WPI) could be useful predictors of freight indices for the following month. Open truck indices follow WPI while Container truck indices follow CPI.

The underlying data used for computing the indices is based on Rivigo's marketplace transactions and machine learning and economics principles powered algorithms that use millions of data points. The algorithm is continuously learning and will only get better with time and transaction volumes. The journey towards creating a truly transparent digital marketplace has only started. It is for the industry to unlock the multi-billion-dollar opportunity that lies ahead.

Chapter 1: The pressing need for a Freight Exchange and Index

1.1 Lay of the land: A USD 130-140 billion market

In FY19, the Indian GDP is expected to cross USD 2.7-2.9 trillion in nominal terms[1]. The spend on logistics, largely flat in the last 5 years, is around 13-14% of the GDP[2]. About 50% of this spend is on transportation, which translates to USD 190-200 bn. Almost a similar amount is spent on inventory costs, which includes holding capital costs, warehousing, pilferages, damages and obsolescence.

65% of the annual billion-ton-km (BTKM) moved across the country is by road. Since bulk of the rest of 35% is rail, and given road is almost 1.8 to 2 times as expensive a mode as rail, road freight constitutes almost 75% of the total transportation spend, which is roughly USD 150-160 bn for 2018[3]. Approximately USD 20 bn out of this is the time sensitive and part-truck-load freight market, leaving **USD 130-140 bn for regular full truck load (FTL) freight market**[4].

1.2 Spot deals or contracts: What's more common?

It is intuitive to think that bulk of the spend is on contractual agreements between shipper and the transporter. However, reality is that bulk of the bookings are on spot basis. Here's why.

- Agriculture and MSMEs form about 50% of the spot freight (USD 60-70 bn).
    - Spot trucking can largely be attributed to agriculture and industry, which constitute 38% of India's GDP (15% and 23% contributions respectively)[5]. About 58% of the GVA in the industry sector is on account of manufacturing.
    - 25% of the road freight spend (USD 30-35 bn) in the country is by the agriculture sector[6]. Due to very short shelf lives of the products moved and the seasonality of the industry, almost the entire agricultural produce transportation is done on spot bookings.
    - Rest of the 75% of the road freight is by the manufacturing sector. Micro, small and medium enterprises (MSMEs) contribute 6% to the manufacturing GDP of India by value, but as high as 34% by volume[7]. MSMEs, due to their low relative production volumes and drop sizes, operate on spot markets for freight bookings. Hence, this adds another 25% of the road freight (USD 30-35 bn) spend to spot transactions.
- In the remaining 50% of spend (driven by large size manufacturing firms) transportation partners typically operate with owned and market fleet to meet client guidelines on service levels. A large sized steel maker can mandate transporters to have up to 30-40% owned fleet. However, rarely does a transporter have both onward and return leg contractual agreements[8]. Transporters for such large size firms rarely have more than 15-20% of total ton-km booked on contractual basis. Hence, conservatively, at least 80% of truck bookings (USD 50-60 bn) in this segment are booked on spot (excluding specialized vehicles such as tankers and dumpers)

This makes **India's road freight industry a giant spot marketplace with USD 110-130 bn trade value growing at 9-10% per year**[9] **as against India's GDP growth rate of about 7%**[10].

1.3 The major players in the game

In this section, various actors in this marketplace are discussed to understand the complexities that prevent the freight marketplace from functioning at optimum efficiency.

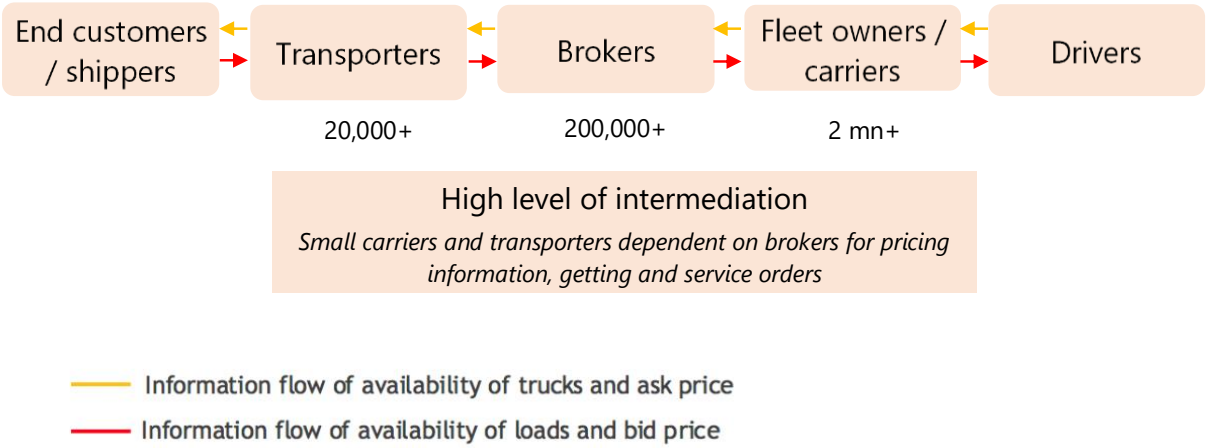

FIGURE 1 : SCHEMATIC REPRESENTATION OF MAJOR PLAYERS

I. **End customer / shipper**: Provides loads to be moved on a day to day basis. They could be manufacturers, traders or retailers or any actor which owns the goods to be moved. The loads provided come along with load tonnage, preferred truck type, loading and unloading point(s), an expected freight rate and sometimes loading instructions.

II. **Transporter**: Takes the operational and financial risk of moving the goods from the loading to the unloading point. He is responsible for truck placement, paperwork, payments to supplier, tracking of goods, collection from end customer upon submission of proof-of-delivery. If he has entered into a contract (fixed price for agreed lanes usually lasting 6 months to 3 years with fuel price variation clauses) with the end customer, he might be mandated to serve a certain percentage of loads (typically 30-40%) with his owned vehicles in order to ensure placement service levels. The rest of the onward loads and almost all of the return loads are served through the spot markets. Hence, the transporter needs to place his owned as well as market sourced trucks and manage with contracted rates or run the risk of losing the share of wallet of the client in the contract renewal process. Setting the right contract rates early becomes imperative for the transporter to stay afloat.

III. **Broker**: Transporters or sometimes end customers directly reach out to these agents to source supply. Usually a single-person shop setup in a *truck mandi*[11], the booking agent ties up with or 'attaches' himself to anywhere between 20-150 trucks spread

across 10-20 fleet owners. Brokerage charged is typically between minimum INR 500-1000 per truck placed or 3-8% of spot rates booked for the specific source, destination and truck type[12].

IV. **Fleet owner / carrier**: They own trucks and typically engage 1-2 drivers per vehicle. 75% of India's trucking inventory is with those who own up to 5 trucks. Only 10% is with fleet operators owning 20 or more trucks. Small fleet owners or single truck driver cum owners are hugely dependent on these agents to provide loads and keep their truck utilization up.

1.4 Spot in trucks: How does it work?

End customers post their loads to transporters close to the market closing hours (usually one day before the loading date), depending on which part of the country they are in. Transporters in turn start communicating with booking agents and share truck requirements for the next day. Each transporter has 5-15 broker partners he reaches out to. In turn, brokers reach out to 8-12 fleet owners for every full truck load.

Most loads require that a broker confirm the truck details within 1-3 hours of request, even if the loading is scheduled many hours away or on the next day. This leads to a tricky situation for both demand and supply sides. While waiting longer gives time to negotiate for better rates, it also increases the chances the load or truck will get booked by the time a satisfactory price is found, as each spot order comes with an urgency.

As a result, **the entire marketplace becomes a collection of close walled mini-marketplaces of 20-100 players where no single party can stake claim to know the best estimate of**

- Count of available loads and trucks
- Either party's willingness to pay, and
- Spot rates across more than a few lanes

1.5 The transaction costs: USD 8-16 billion value waiting to be unlocked

The industry bears the brunt of these inefficiencies in the following ways.

- **Brokerage cost (A)**: Brokerage fees are typically 3-8% of the spot rate. About USD 3-6 bn is spent annually on facilitating these transactions. This amount underscores the importance brokers play in the freight marketplace, especially in getting loads to small fleet owners who have no other trustworthy means of accessing loads. Contrast this with equity brokerage firms who charge anywhere between 0.01 to 0.5% brokerage fees or in real estate where 1% of deal value as brokerage is the norm.
- **Inventory holding cost (B)**: On and above the one-day planning time already built in, delays in getting the load or the truck, irrespective of the price, adds to the delays. On the demand side, costs for 0.5 to 1 day of additional inventory are to the tune of USD 2-4 bn.

- **Truck underutilization cost (C)**: Currently, spot market listed trucks clock 5000-7000 km per month on an average, assuming they run on 22-26 days in a month against 4-5 loads. A delay of 1-2 days in getting loads would mean 4-8% increase in fixed costs apportioned per trip. This translates to USD 2.5–5 bn of additional fixed cost loading on FTL rates.

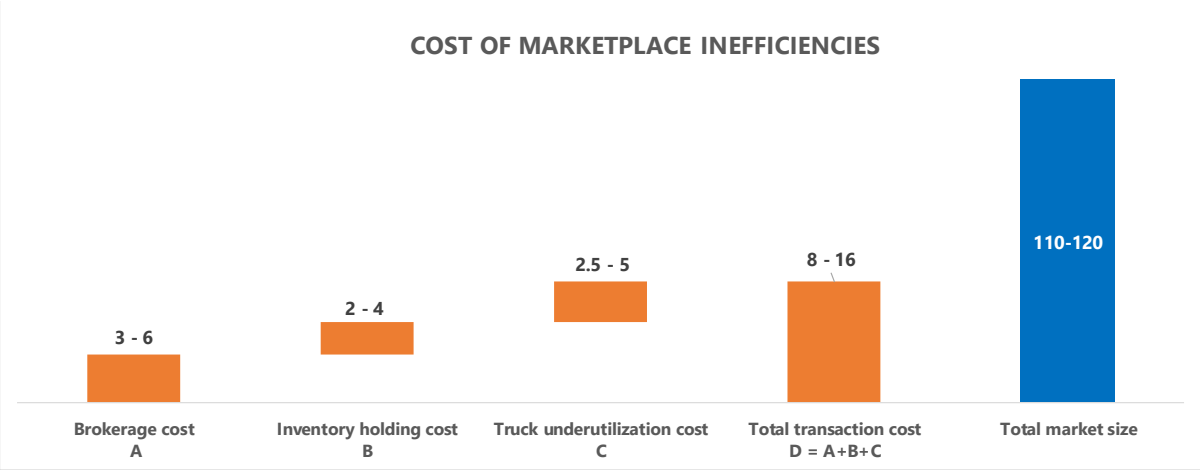

FIGURE 2 : VALUE UNLOCK POTENTIAL IN SPOT MARKETPLACE (USD BN, 2018)

Hence, the industry ends up paying about USD 8-16 bn as transaction costs (A, B and C). This is at least 7-14% of the entire trucking spot market in the country.

Additionally, there are costs related to information asymmetry on pricing. In order to immune oneself from spot rate swings, both demand and supply sides end up leaving value at the table. The willingness to pay on the demand side is typically 2-4% on the higher side and suppliers are often willing to work with 2-4% discount in case trucks are heading towards their base locations on a return leg. Almost 4-8% of deal value or USD 4-10 bn is lost on account of lack of price transparency.

The clock is ticking as the industry is growing at 8-10% per year. This problem can be addressed through a trustworthy freight exchange which removes the information asymmetry at scale. The exchange should reflect day to day movement in prices across majority of lanes and truck types in the country, empowering even the smallest fleet owner in the remotest of mandis.

The lack of price transparency not only affects the parties directly involved in spot transactions but also policy and decision makers across government bodies, financial institutions and manufacturing industries impacted by the performance of the freight industry. Until now, there has been no composite index which reflects the performance of the spot market in the country, that is available for all and at all times. Information is disparate, disseminated only with press releases, limited to few key lanes, marred with lack of specificity and gathered through select

sources where the risk of a sampling bias is high. The industry needs an equivalent of a NIFTY or a Baltic Dry Index or a Wholesale Price Index.

1.6 A freight exchange and a freight index: Two-pronged solution

Multiple use cases arise when the composite index is tracked over time and compared with other macro-economic indicators such as fuel rate. For example, simplistically, if the spot rate index suggests that rates have fallen over the last two quarters by 10% coupled with a rise of 5% in fuel prices, it would be evident that the freight industry profitability is in stress.

- CV OEMs can cut down their forecasts and focus on after sales for the next quarter
- NBFCs can tune down their spreads for few quarters
- Government can relax toll taxes for a quarter across major highways
- Large transporters can pushback purchases by a few quarters till the over-supply subsides

For these reasons, the Rivigo Rate Exchange (RRE) was created. Further, the National Freight Index (NFI) has been launched based on the prices reflected in the exchange. **While the Rivigo Rate Exchange (RRE) gives a live spot rate on over 7 million lanes (origin, destination) and vehicle type combinations in the country, the NFI is a comprehensive barometer of the road freight spot market, offering an aggregated picture of both, live rates and historical trends of spot prices across 150 different combinations.** The index is represented in two main forms. Firstly, in terms of actual freight rates condensed to INR per ton-km, and secondly in terms of relative movement with respect to a base month.

Both, the index and the exchange, are based on machine learning and economics powered pricing algorithms which are continuously learning and improving. The rates on the exchange and the indices are computed using millions of data points from historical transactions, proprietary sources and crowdsourced data with the ultimate purpose of giving a fair and honest representation of the state of the spot market in the country.

Chapter 2: Making a trustworthy freight index

Imagine a regular user of any trustworthy index, who performs real financial transactions and presents insights to his/her company's management using the index – a number or a trendline which represents the state of affairs of the indicator being measured. A lot rides on the index, especially when organizations are going to take decisions based on the same. Taking cues from several indices such as Brendt Crude Oil Prices, Index of Industrial Production, Baltic Dry Index, SENSEX and others – a freight index should have the following characteristics in order to be trusted and adopted.

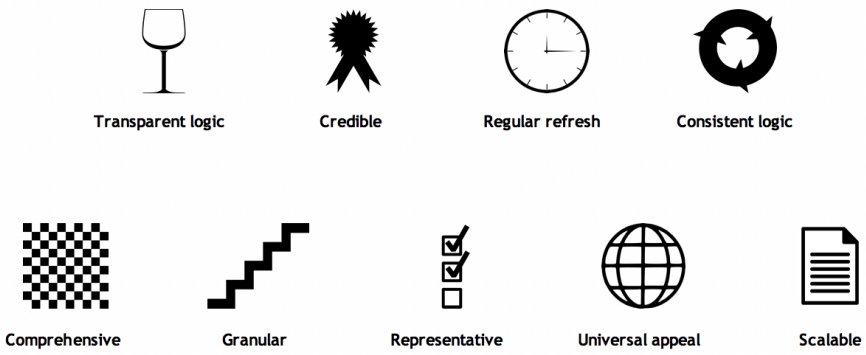

FIGURE 3 : DESIGN PRINCIPLES FOR A TRUSTWORTHY FREIGHT INDEX

I. **Transparency**: The entire computation logic needs to be published alongside the indices in order to improve believability and reduce ambiguity.

II. **Credibility:** The index should be reflective of actual indicators (prices, rates, volumes) and hence one should use more of actual than imputed data.

III. **Regular refresh:** The index needs to be updated on a periodic basis. Thus, only those data sources and categories with regular updates should be used. For example, one cannot use routes or markets where the transaction happens once a month for a daily refresh. The more frequent the update – less the number of data points per update. Hence, one should be cognizant of the trade-offs and perform refreshes accordingly.

IV. **Consistency in logic:** Lanes used, weights assigned, granularity should be maintained period on period. This implies that one cannot change the lanes, weights and granularity for a given time series of index. In the future, one can start off a new series, if based on or started from a different reference month.

V. **Usability:** The index should be useful to the user in the maximum possible way with least additional assumptions. Hence the index should be

- **Comprehensive:** The sub-indices should be representative of the entire market. Hence should have all possible distance bands, zones, most common truck types.
- **Granular:** The granularity should be such that each user can use the most granular index to infer the spot market movement for his own volume / network mix.
- **Representative:** The most granular index should be a measure of at least 4-5 lanes to cover most directions of travel from the source. The count of lanes however is limited by number of data points available.

VI. **Universality:** The index should be universally accepted and understood. Take the case of Container, 32ft mxl, ex North for 750+ km haulage. It is difficult to represent trends on the entire population of lanes with only trip prices or price per ton. Hence, the trends of freight rates on this combination needs to be represented in INR per ton-km as it is universally accepted and can easily be used by users for their own network footprint.

VII. **Scalability:** The index should meet all bars on credibility and regulatory requirements for any new developments, now or in the future, built upon the index. For example, if a derivative product is built on the index, the underlying data should be reflective of highly liquid transactions and meet any legal criteria required.

These principles have been adhered to while designing and building the National Freight Index.

Chapter 3: Using NationalFreightIndex.co.in

The page hosts the freight indices and many other useful features for visitors, as discussed below.

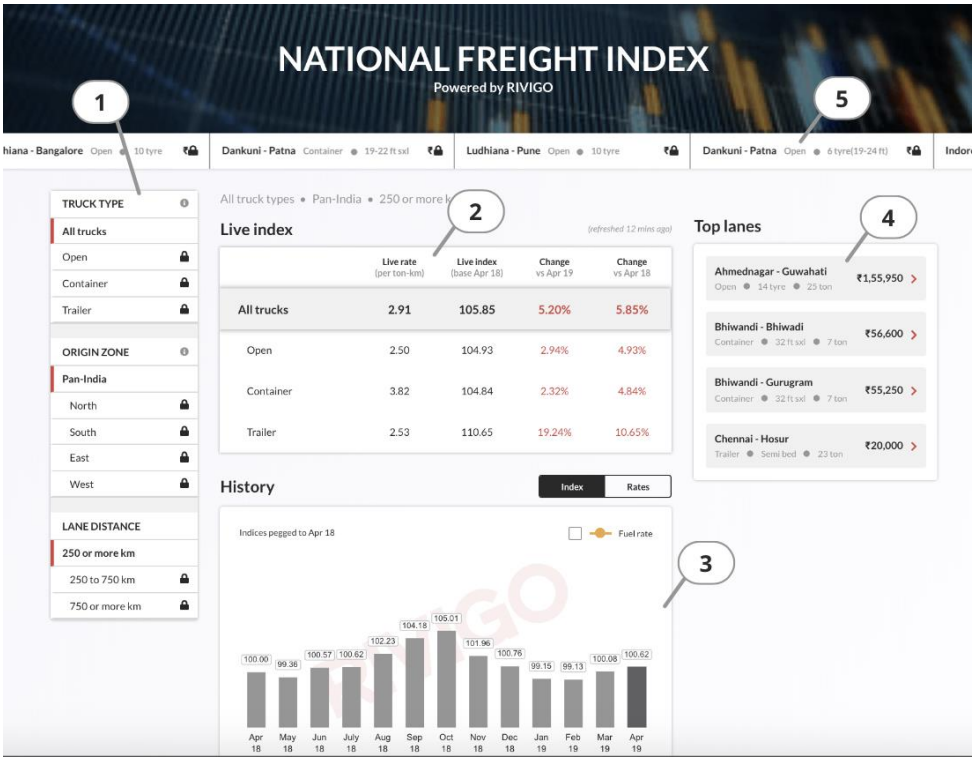

FIGURE 4 : NFI PORTAL WITH KEY FEATURES

1. **Filter tray:** A user can view indices at 150 different combinations of truck type, origin zone and haulage distance depending on the use case.
2. **Live section:** This portion gives users the live rates at the granularity chosen through the filters. The same is represented in the pegged form with the base month as Apr-18. A comparison with the previous month and the same month last year is also shown.
3. **History section:** Here a 13-month historical is available trend and users can overlay fuel prices relevant to the filters chosen to draw insights.
4. **Top lanes:** This section gives a view of the prevailing market rates and a 6-month price history on some of the key lanes referenced to compute the index for the particular selection of truck type, zone and distance.
5. **Rivigo Rate Exchange (RRE):** The ticker gives users complete access to live full truck load rates across 7 million origin, destination, vehicle types in the country.

Under the 'insights' section, users can also read through the NFI team's perspectives on the National Freight Index, and some of the interesting observations found by analysing NFI along

with other macro-economic indicators in the country. The section will also have insights from ground teams and users, who can give more concrete explanations and context to some of the movements in the index. The NFI team will be sharing insights on a fortnightly basis, alerts to which users can subscribe to.

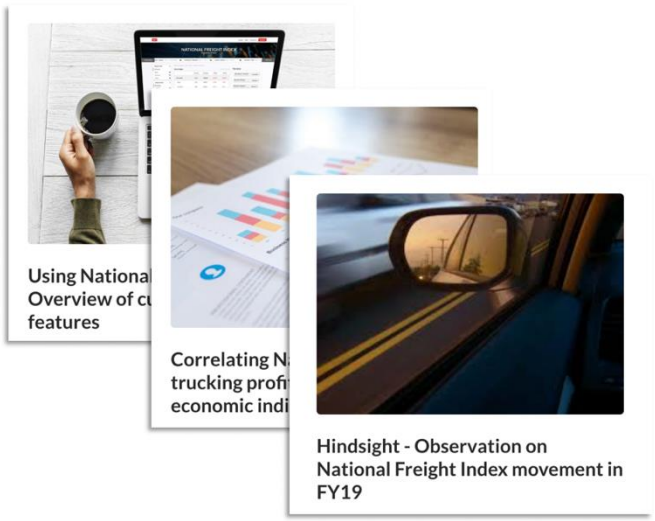

FIGURE 5 : FORTNIGHTLY ARTICLES ON INSIGHTS FROM DATA AND FIELD

Users get an exhaustive experience while browsing through the NFI website. Going forward, several more insightful features will be launched. One such feature is where enterprises can customize the weights used, build an index which is on the lines of their own business footprint and can simulate any potential savings on their road freight bill by moving from contract to spot rates. Another such feature is an on-ground mood reflector, broadcasting sentiments of users and their responses to specific questions deemed relevant, based on patterns observed on NFI.

Chapter 4: Sample use case – drawing insights from NFI

The National Freight Indices' monthly averages at a pan-India level for all truck types (open, container & trailers)[13], were compared against monthly averages of several other market indicators.

Index	UoM	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19
Pan-India : All trucks	*vs Apr-18*	**100.0**	**99.4**	**100.6**	**100.6**	**102.2**	**104.2**	**105.0**	**102.0**	**100.8**	**99.2**	**99.1**	**100.1**	**100.6**
Pan-India : Open	*vs Apr-18*	100.0	97.3	98.6	99.1	100.2	101.6	102.2	100.6	100.0	98.8	99.5	100.9	101.9
Pan-India : Container	*vs Apr-18*	100.0	104.8	106.1	106.9	108.2	112.8	112.3	107.2	104.4	101.7	101.3	101.4	102.5
Pan-India : Trailer	*vs Apr-18*	100.0	91.4	92.1	89.2	92.9	89.9	94.4	92.9	93.6	94.1	93.1	94.7	92.8
Diesel price (avg)	*INR / lit*	67.9	69.8	70.3	71.2	75.4	75.9	72.6	65.9	65.6	67.4	68.3	67.6	67.7

** redder the shade, the higher the value*

FIGURE 6 : ALL-INDIA FREIGHT INDICES FOR FY19 ACROSS TRUCK TYPES

Following factors were considered:

I. Fuel
II. Inflation
III. Interest rates
IV. Industrial production
V. Stock market sectoral and composite indicators
VI. Other lead indicators e.g. Purchasing Managers' Index

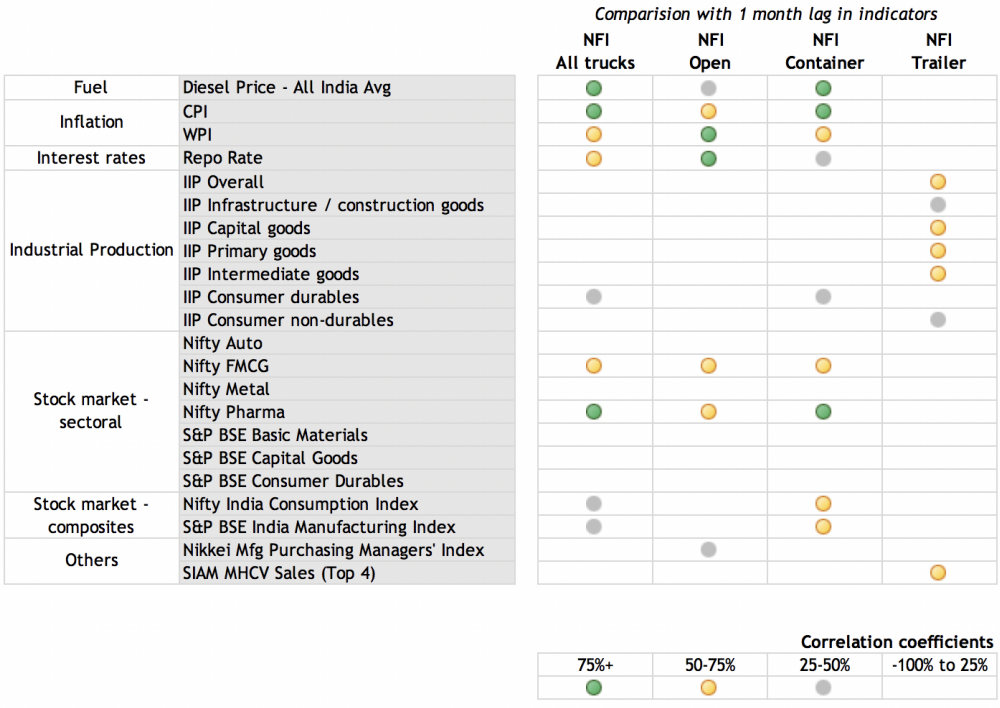

FIGURE 7 : CORRELATION OF ALL-INDIA INDICES WITH MACROECONOMIC INDICATORS (FY19)

- NFI Open and NFI Container have moderate to strong correlations with fuel, inflation and interest rate-based indicators. These are understandable as all three buckets directly impact the input costs for truckers. As stated earlier – trailers are apparently immune from shock in factor prices and follow a fairly stable index curve.
- NFI Container is strongly correlated to national fuel prices (90% correlation) as compared to NFI Open (40% correlation). This means Container truckers are more likely to pass on fuel price hikes and troughs to shippers than Open truckers.
- NFI Open follows Wholesale inflation indices while NFI Container follows Consumer inflation indices. This is further evident in NFI Container's strong movements with consumer facing indices such as FMCG, Pharma, India Consumption.

It is recommended that companies keep a tab on input cost factors such as fuel, inflation and interest rates to predict future freight rates. They can use sector indices as guiding principles which could further suggest direction and magnitude of freight rate trends.

Going forward, an outlook on the coming month for both the freight and its related industries will be shared on the RRE, based on the predictive potential of the indicators studied so far. For example, the commercial vehicles (goods) industry within auto sector should be specifically interested in the profitability indices – a measure of net income gathered by each segment, proxied by normalizing freight indices with fuel and interest rate expenses. Fuel is assumed to be 45% of the total freight bill, with EMI 30% of the interest expense. Any other factor costs influenced by inflation (e.g. driver salaries, maintenance) will not be reflected month on month. Hence,

$$Profitability\ index = \frac{Freight\ Index\ value\ for\ month}{1 + f * fuel\ price\ index + i * repo\ rate\ index}$$

Where,

f = percentage of freight bill which comprised fuel expense
i = percentage of freight bill which comprised interest expense

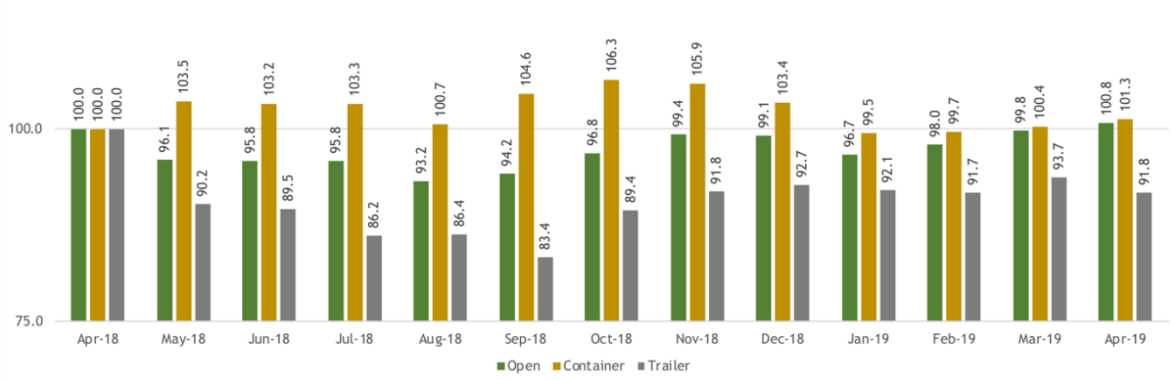

FIGURE 8 : PROFITABILITY INDICES BY TRUCK TYPE FOR FY19

Some of the interesting observations from the profitability indices are as follows:

- Open, which constitutes >60% of spot market ton-km for India was netting less profits as compared to the start of the financial year primarily due to
    - Increasing fuel prices in Q2 FY19
    - Disproportionate passing on of fuel price burden to demand
    - Revision of repo rates twice by 25 bps in the FY, leading to expensive loans
- This was reflected in the 20% decline in sales of Medium and Heavy Commercial Vehicles (MHCV) segment of top CV manufacturers in the country for Nov 2018.
- After the increase in loadable capacity after the gross vehicle weight (GVW) revisions, truckers have crossed the profitability levels of Apr 2018 in Feb 2019. Hence, FY20 Q1 can be expected to have good y-o-y growth in the MHCV segment.

Chapter 5: Making of NFI – overview of computation methodology

This section outlines the methodology adopted to compute the National Freight Index. The design principles discussed earlier were adhered to make NFI a comprehensive and trustworthy index.

5.1 Representation

The National Freight Index is represented in two major forms. Firstly, in INR per ton-km and secondly, as a figure pegged to a base month. April 2018 is considered the base month. This is how most indices are represented, in a purist as well as a pegged form.

The National Freight Index is computed live and is refreshed every hour on Rivigo's Freight platform. Along with this, average indices for a month are published for the previous 13 months. In order to further analyze index trends, avg. fuel rates for the month are available for overlaying on historical trends. The methodology for computation of each of these are explained in a later section.

5.2 Granularity

Fundamentally, the NFI is a composite of several sub-indices. In some places, few cohorts have been combined to aggregate more data points for computational reasons. The granularity available on the NFI page is as follows:

- Truck types ***(10 options)***
    - All trucks
    - All Open
    - *6 tyre*
    - *10 tyre*
    - *12 tyre*
    - *14, 18 and 22 tyre (combined to represent the large Open truck segment)*
    - All Containers
    - *32 ft mxl*
    - *32 ft sxl*
    - All trailers (combined high and semi bed variants)
- Zone of origin of lane ***(5 options)***

  Following zonal options are available:
    - Pan-India
    - North
    - South
    - East
    - West

The states considered in each zone are as follows:

- North: Delhi, Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan, Uttar Pradesh, Uttarakhand
- South: Karnataka, Andhra Pradesh, Kerala, Tamil Nadu, Telangana
- East: Arunachal Pradesh, Assam, Bihar, Jharkhand, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Sikkim, Tripura, West Bengal
- West: Chhattisgarh, Goa, Gujarat, Madhya Pradesh, Maharashtra

- Haulage distance ***(3 options)***
  - 250 or more km
  - 250 to 750 km
  - 750 or more km

  Medium and long-haul lanes are focused on, as short haul lanes have very high price volatility, not because of demand and supply imbalances, but because of transit conditions (city roadblocks, detours, truck free hours, etc.). Further, short haul constitutes only 5-10% of the total billion-ton-km (BTKM) of freight traversed on road in the country.

Hence, a total of 150 different combinations can be selected to view the index at the granularity required. The truck types and the haulage distances available for selection contribute to almost 70% of the total billion ton-km (BTKM) moved in the country and hence are fairly representative of the overall spot market in road freight.

5.3 Selection of lanes

An index can be represented at the most granular level as truck type, zone of origin and haulage distance. For example: Container 32 ft mxl, from North, for 750+ km. There can be 56 combinations possible at this basic level (choice of 7 truck types, 4 zones, 2 haulage distances). We have carefully sifted almost 950 ODVts (lanes (OD) + specific vehicle type (Vt)), across these 56 combinations, which will be used to compute and aggregate the indices periodically.

Following checks have been applied for selection of the lanes:

- The origins and destinations of lanes must be in the list of locations with high road freight traffic thoroughfare in the country. For the same, 120 locations were selected, 30 in each zone, which contributed to 65-70% of the traffic in the country. The traffic information was fetched using Rivigo's internal traffic volume information based on trips, load posts and load requests and toll-booth transactions at 300+ booths across the country during the period July to Dec 2018.
- The lanes must cover all 4 travel directions in each zone i.e. towards North, South, East and West from any zone. This was done through visual inspection.
- There must be at least 10-20 lanes for each of the 56 combinations
- The lanes must have a decent trip or load post history on Rivigo's Freight platform, enough to give at least 3 data points in each month per lane.

- If the lane does not have a data point for a month, the algorithmically imputed lane prices available on Rivigo Rate Exchange will be used.

5.4 Computing the base level index rates

Historical monthly averages

As stated earlier, users of the National Freight Index can view the same at the most basic level of truck type, zone of origin and haulage distance. Let this level be BL (stands for base level). The objective is to compute the monthly average INR per ton-km at this level. This is done by rolling up indices from two more granular levels. Suppose,

- For a particular vehicle type (Vt), the base level (BL) could be represented as: Container 32 ft mxl, from North, for 750+ km.
- Each BL is composed of 2-4 District Pairs or DPs: DP_1, DP_2, DP_3, DP_4, and so on.
- Each DP is composed of 4-10 Lanes: say DP_1 is composed of $Lane_1$, $Lane_2$, $Lane_3$, $Lane_4$ and so on.

For month M, DP_1 is computed as,

$$\frac{\sum_{i=1}^{n}(Sum\ of\ trip\ price\ for\ all\ trips\ on\ lane\ i)}{\sum_{i=1}^{n}(typical\ tonnage\ for\ vehicle\ type\ Vt * distance\ for\ lane\ i)}$$

Where n is the number of lanes within DP_1.

For month M, BL is computed as

$$\frac{\sum_{i=1}^{p}(DP\ i * weightage\ i\ )}{\sum_{i=1}^{n}(weightage\ i\ )}$$

Where p is the number of DPs within BL and weightage is the weight attributed (explained later)

Live rates

The real time rates or indices are computed with a method similar to the one stated earlier. Again, suppose,

- For truck type, Vt, base level is BL: e.g. Container 32ft mxl, from North, 750+ km.
- Each BL is composed of 2-4 District Pairs or DPs: DP_1, DP_2, DP_3, DP_4, and so on.
- Each DP is composed of 4-10 Lanes: say DP_1 is composed of $Lane_1$, $Lane_2$, $Lane_3$, $Lane_4$ and so on.

At any given time, DP_1 is computed as,

$$= \frac{\sum_{i=1}^{n}(Sum\ of\ live\ Rivigo\ Freight\ Exchange\ rate\ for\ lane\ i)}{\sum_{i=1}^{n}(typical\ tonnage\ for\ vehicle\ type\ Vt * distance\ for\ lane\ i)}$$

Where n is the number of lanes within DP_1.

For month M, BL is computed as,

$$\frac{\sum_{i=1}^{p}(DP\ i * weightage\ i\ )}{\sum_{i=1}^{n}(weightage\ i\ )}$$

Where p is the number of DPs within BL and weightage is the weight attributed (explained later).

5.5 Computing the aggregated index rates

At any level, weightages have been assigned to the summed total of the ton-km moved across all lanes under that level. The loads posted from Apr to Dec 2018 on the Rivigo freight platform and the total toll-both exits by trucks using FastTag payments information on key lanes have been used to determine these weights. The bare minimum level at which rates have been defined is district pairs or DPs. For any DP, weightage is defined as

$$w = \sum_{i=1}^{t}(Count\ of\ loads\ on\ Rivigo\ platform * vehicle\ loading\ weight * lane\ distance)$$

Where t is the number of lanes covered under the level.

Suppose, for a truck type, Vt, the base level is BL. For example, Container 32 ft mxl, from North, for 750+ km.

Total weight assigned to this BL is represented by:

$$w(BL) = \sum_{i=1}^{p}(weightage\ assigned\ to\ district\ pair\ DP\ i)$$

Where p is the number of lanes covered under the level.

For any rolling up, to compute an aggregate index, the following logic is used:

$$w(aggregate\ level) = \frac{\sum_{i=1}^{q}(index\ value\ for\ BL\ i * weightage\ assigned\ to\ BL\ i)}{\sum_{i=1}^{q}(weightage\ assigned\ to\ BL\ i)}$$

For example, to arrive at index for Container 32 ft mxl, from North, the following logic will be used:

[(Index value $_{\text{Container 32 ft mxl, from North, for 750+ km}}$ * weightage $_{\text{Container 32 ft mxl, from North, for 750+ km}}$)
+
(Index value $_{\text{Container 32 ft mxl, from North, for 250-750 km}}$ * weightage $_{\text{Container 32 ft mxl, from North, for 250-750 km}}$)]
/
(weightage $_{\text{Container 32 ft mxl, from North, for 750+ km}}$ + weightage $_{\text{Container 32 ft mxl, from North, for 250-750 km}}$)

These weightages are planned to be kept unchanged with time and if changed will be communicated to all concerned users. NFI team can be contacted to get more information on the weightages.

5.6 Pegging index rates to base month

As stated earlier, all composite values on NFI are represented in two major forms. Firstly, in INR per ton-km and secondly, as a figure pegged to a base month. For simplicity, the term 'rates' is used for the former and 'index' for the latter. A pegged index is represented as:

$$Index\ (pegged) = \frac{\text{INR per tonkm for the current time period under considered}}{\text{INR per tonkm for the month of April 2018}}$$

5.7 Diesel prices for each month

The fuel rates shown on the NFI page are available at All-India and zonal levels. Daily prices across all states in India are sourced. A monthly average price for diesel for a zone is simply the arithmetic mean of the daily prices across all days of the month across all states within the zone. States have been categorized into zones as per the aforementioned list specifying various states considered across zones.

List of abbreviations

- NFI : National Freight Index
- RRE : Rivigo Rate Exchange
- FTL : Full Truck Load
- CPI : Consumer Price Index
- WPI : Wholesale Price Index
- BTKM : Billion ton-km
- GVA : Gross Value Added
- GDP : Gross Domestic Product
- MSME : Micro, Small and Medium Enterprise
- CV : Commercial Vehicle
- MHCV : Medium and Heavy Commercial Vehicle
- OEM : Original Equipment Manufacturer
- NBFC : Non-Banking Financial Company
- GVW : Gross Vehicle Weight
- Vt : Vehicle Type or Truck Type
- BL : Base Level
- DP : District Pair

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