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KEYWORDS › Commodity price risk › Hedging › Indian construction companies › Price volatility › Risk pass-through

SCENARIO OF COMMODITY RISK Management Practices used by INDIAN CONSTRUCTION COMPANIES

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ABSTRACT

The current global commodity rout and climate of volatile commodity prices has created enormous pressure on Indian construction companies' profit margins, risk profiles, and overall performance; which is further being hampered by sluggish growth in Indian infrastructure sector. Moreover, commodity price uncertainties are pervasive throughout the construction project lifecycle, occurring at project initiation and continuing through execution. This commodity price volatility can lead to higher project costs and more risk to various project stakeholders like suppliers, contractors, and owners which can cause financial distress for all parties involved in the construction process. This research study addresses the problem of commodity price risk volatility being faced by Indian construction sector. Main purpose of this research paper is to study the commodity risk management practices being adopted by surveyed 50 Indian construction companies on various parameters taken for the study like critical commodity, important issues in manging commodity risk, objective and strategy, contracting strategies, hedging instruments & tenure, hedging policy, commodity risk pass-through to customers, bottleneck in implementing commodity risk management practices and commodity sourcing strategies hedging policy decision and hedging benefits. This research study has used questionnaire as primary data collection tool and Microsoft Excel spread sheet and other statistical techniques for analysing research data for the study. Overall research study has made an attempt to illustrate a viable scenario about commodity risk management practices and policy used in managing commodity price risk by the surveyed 50 Indian construction companies, and findings would give further research direction for further study on commodity risk management scenario to be tested for other Indian companies, especially infrastructure sector companies who are extensively using project inputs mainly commodities/raw commodities.

JEL Classification Code: G10, G11, G13, G15

1. Introduction

In this global mayhem of commodity rout, constant fluctuating commodity prices create opportunities and hazards for construction companies in the marketplace. Construction companies generally prefer to limit their exposure to rising commodity prices, but simultaneously also wants to benefit from falling prices. The robust global economy and the increasing appetite from emerging countries like China and India has increased demand for commodities from agriculture to industrial commodities. In this scenario, construction companies unable to pass high commodities price cost to their project customers and being forced to absorb the cost which dampens their profits. Construction industry within Infrastructure sector is a key driver for the Indian economy. The sector is highly responsible for propelling India's overall development and enjoys intense focus from Government of India for initiating policies that would ensure time-bound creation of world class infrastructure in the country. Commodities typically account for 40-45% (as per study conducted by Construction Industry Development Council of India) of construction costs. Maintaining an efficient and effective commodities procurement system and purchasing the commodities at the right prices, the specified quality and on schedule are critical for contractors to stay competitive. The risk of labour and material prices fluctuating after the contract has been signed can erode profits of the contractors or cause the owners to pay premiums over current market prices. Usually, price hike is not an option whether because of market condition, long-term agreement with customers, fear of losing competitive edge etc.

Cost structure of Indian construction industry is dominated by raw material cost and subcontracting cost. Raw material cost which is the major cost accounts for 40-45% of the total cost and subcontracting cost accounts for about 20-40%. In India, construction projects require two essential commodities cement and structural steel and both are highly sensitive in terms of economic recovery as well as demand/supply scenario. As material cost compromises 40-45 % of most of the construction projects and this cost goes even higher for some of the large-scale infrastructure projects. Unprecedented rise in prices of these two raw commodities has a direct impact on the cost of the project and in turn margins of construction companies. Profitability also depends upon the diversity of the projects a company can execute. Price volatility in commodities hits both contractors' project margins and clients' project cost (as contractor will usually pass-through excess commodity price in terms of applying escalation clause) in a wide range of sectors. Considering nature of projects and client requirements, Indian construction companies have a large commodity exposure due to their purchases of different commodities during a long project which compel contractors to purchase commodities at different prices which could be higher or lower than price being considered during project bid/proposal stage by contractors. A construction project can last from a few months up to several years (depends on nature and WBS (Work Breakdown Structure of projects)) in which time the commodity prices might have changed dramatically. Hence, controlling the commodity price risk is an important part of managing the project processes for many construction firms, as an adverse change in prices can greatly impact the profitability and operation performance.

In this type of situation, suitable and effective commodity risk management practices can warrant construction companies against commodity price volatility which can be also cost effective way to minimise downside risk. However; in good times (when commodity price goes down) it may seems as unnecessary expense, but it is just a small price to pay for being protected for volatile and tough times. Construction companies with effective commodity hedging strategies can maintain lower project commodity costs than their competitors and minimize earning volatility. The main problem with commodity price volatility is the financial risks that it places on the construction project stakeholders involved. Construction project customers want the best price while the contractors and suppliers are trying to survive on decreasing margins. The problem with the current way of doing construction project business in India is that the construction project customers are the only ones benefitting from price volatility in most Indian construction projects. Construction project contractors take the majority of the risk and are trying to find effective ways of distributing risk more equally to provide benefits for all construction project stakeholders involved in the project. The economic market continues to have swings and there is no way of accurately predicting future prices of construction commodities.

Against this backdrop, the present research paper aims to study the commodity risk management of 50 selected Indian construction companies and implementation of their commodity risk management practices. The main objective of this research work is to study commodity exposure and its risk management practices along with its mitigation strategies being adopted by the selected 50 Indian construction companies. This research has primarily used questionnaire survey as a source for collecting primary data. However, to measure certain parameters to access effectiveness of commodity risk management practises such as commodity hedging impact on financial performance, several financial statements like profit & loss statement, cashflow statement and balance sheet were used as source of secondary data collection. Main beneficiary of this research will be Indian construction project companies who are dealing in EPC (Engineering Procurement Construction) and Construction projects who are mainly dealing in fixed price project contracts where fluctuations in commodity pricing and/or supply may impact on the project's profitability. Research findings would give further research direction for further study on commodity risk management scenario to be tested for other Indian companies especially infrastructure sector companies.

2. LITERATURE SEARCH

A systematic assessment of past literature is a vital part of any academic research. Commodity risk management practices among Indian construction companies is an untapped area in research as least amount of research has been concluded so far in this context. However, in the current research study attempt has been made to review ongoing research pertaining to commodity risk management in construction sector from the global context for firming up research objectives for the current study.

(Loulakis, 1992): Paper has mentioned that under a well-established principle of common law, a contractor assumes the risk of unexpected increases in the cost of commodities and supplies necessary for performance absent an express contract provision shifting risk to the owner. Even substantial increases in price do not entitle a contractor to relief under the contract absent a price adjustment clause transferring this risk to the other party

(Williams, 1994): Research study has mentioned that a construction contractor uses documentation in the form of an invoice or certification from a supplier to substantiate the changes in commodities price. It must demonstrate the change in material price from the time the contract was signed to the time of the actual purchase

(Stulz, 2002): Paper has highlighted that commodity derivatives are also widely used by companies for risk management. Suppose an airline company wants to hedge against the rising cost of jet fuel, it could lock in an agreed price with fuel suppliers for its purchase price through derivatives.

(Navon, 2005): Study mentions that with construction commodities prices varying greatly throughout the duration of construction projects, commodities need to be managed closely as to when they are ordered, when they arrive and in the proper quantities. With price volatility having such an effect on the construction industry, commodities management becomes key in ensuring contractors profit margins are met.

(Gallagher et al., 2006): Study has studied highway projects and based on its observations it is mentioned that sharp increase in the price of crude oil and its by-products such as asphalt cement which is one of the most important commodities in highway construction projects is often argued as a major reason for increasing construction cost in highway projects which results in large contingencies for highway projects that are often included in the initial estimates of bid items to hedge against the risk exposures.

(Mc-Goldrick, 2006): Study recommends that it was better for the owner to pay the actual increase in costs rather than pay a significant contingency included within the contract price, which might ultimately be higher than

the cost of material increases. However, this result should be taken with caution since risk preference may contribute to the decision to go one way or the other. Thus, when risk and uncertainty from volatile commodity markets result in overpriced bids, the potential payoff of including adjustment clauses for construction companies are high.

(Fung, 2008): Paper has highlighted that construction contractor that could be benefiting from the decreasing prices on their lump sum contracts by buying items at a lower cost than originally bid are not seeing the anticipated benefits of the cost declines on current projects.

(Haughey, 2009): Study reveals that in commercial construction, all bidders do not estimate projects the same and as a result, there can be great fluctuations in bid amounts. Resources needed on each project typically vary and are often specialized for and individual project. The price fluctuations leave the bidding contractors at risk since the volatility of construction commodities and labor prices cannot be predicted.

(Nguyen et al., 2010): The focus of their article has been on investigation of the relationship between the use of financial derivatives and firm risk using a sample of Australian firms. Their results suggest that this relationship is nonlinear in nature.

(Justin Earl Weidman, 2010): Under the paper "Best Practices for Dealing with Price Volatility in Utah Commercial Construction" has highlighted that Price volatility continues to be a concern in the construction industry. Participants in the industry are concerned about the risk of volatility and are using methods to control their risk. However, there is no one method that all classifications can use to eliminate or control the risk of price volatility

(Macdonald, 2013): Thesis has developed and proposed a model for materials price risk mitigation using financial derivatives for use in the Engineering and Construction (E&C) industry. As per her thesis outcome it is evident that use of hedging as a tool for material price risk hedging. She argued that despite the negative reputation of financial hedging, following the 2008 financial crisis, construction companies could use this approach as a strategy to protect against cost escalation. Study has also developed a conceptual model to mitigate commodities price risks.

(Al-Zarrad et al., 2015): In their research paper on application of hedging principles to commodities price risk mitigation in construction projects have proposed the framework to apply construction material hedging by using weather hedging and fuel hedging as precedents. This research provided a detailed investigation of how the airlines have conducted hedging for fuel costs, and identified best practices in the area. The identification of fuel hedging best practices provided the general framework for construction material hedging.

The investigation of these phenomena and commodity risk management practices along with commodity hedging strategies currently adopted being used in surveyed 50 Indian construction companies is the main research area of this study.

3. RESEARCH METHODOLOGY

3.1 Research Objectives

The present study focuses primarily on Indian construction companies who are dealing in various infrastructure areas like roads & highways, power, railways & metros, urban infrastructures and real estate. The main objective of this research work is to study commodity exposure and its risk management practices along with its mitigation strategies being adopted by the selected 50 Indian construction companies. The study analyses the Indian construction companies' awareness of and attitude towards commodity risk exposure. Research study primarily aims to:

- Examine Indian construction companies' approach towards commodity risk management
- Investigate that how Indian construction companies are safeguarding commodity risk in various stages of project considering extreme price fluctuations and volatility of commodities
- Study hedging strategies along with hedging coverage, tenure and policy decision adopted by 50 Indian construction companies
- Measure hedging benefits and hedging impact on financial performance of the 50 Indian construction companies
- Check the possibilities for the areas of improvement for better commodity risk management adopted by the 50 Indian construction companies

3.2 Research Data

This research has primarily used questionnaire survey as a source for collecting primary data (refer Appendix). However, to measure certain parameters to access effectiveness of commodity risk management practises such as commodity hedging impact on financial performance, several financial statements like profit & loss statement, cashflow statement and balance sheet were used as source of secondary data collection, taken from annual reports of surveyed 50 Indian construction companies. Other secondary tools like extensive literature review of books and journals data and other published data to the context of the study, and also surveyed 50 Indian construction companies website were used for data collection. Hence combination of primary data and secondary data was used for checking various research objectives. Research has mainly investigated effect of various factors on different aspects of commodity risk exposure management with the help of various questions being framed in the questionnaire. Testing of various commodity risk management approach parameters like critical commodity, important issues in manging commodity risk, objective and strategy, contracting strategies, hedging instruments & tenure, hedging policy, commodity risk pass-through to customers, bottleneck in implementing commodity risk management practices and commodity sourcing strategies were studied with various statistics techniques and its interpretations have been made through graphical presentations like figures in the form of Bar Charts, tables etc.

Main intention for collection of primary research data is to analyse surveyed 50 Indian construction project companies' commodity risk management practices along with awareness and attitudes to commodity risk management. Structured questionnaire was used as primary data collection tool for selecting 50 different Indian construction project companies from various infrastructure sectors for the exploratory study. The sample for this study is made up of 50 Indian construction project companies which have carried out commodity risk management practices adopted for last 5 years from FY 2011-12 to FY 2015-16. In order to be included in the sample study, the company should have disclosed information about its commodity risk management practices in its annual report. The notional amounts of commodity risk management practices are intended to measure the company's extent of involvement in transactions that have off-balance-sheet risk. This can also be viewed as transactions conducted by subsidiaries & associates companies, which are not immediately recorded on the balance sheet. Firm-specific data used in the analysis, such as commodity cost in % of total revenue, notional amounts of commodity risk management instruments and revenue, was obtained from company's annual reports. In the selection of 50 Indian construction project companies, this research study has used few company selection parameters for ensuring effectiveness of research outcomes.

Sector/ Segment	Revenue in INR billion	Commodity cost in % of total revenue	Market share in Infrastructure sector	Use of number of Commodities	Size in terms of number of projects

TABLE 01. *Surveyed Company Selection Parameter Framework*

Above parameters were used in the selection of 50 Indian construction project companies, infrastructure sector wise selection of 50 Indian construction companies is as follows, Roads & Highways (total no of companies - 15), Power (15), Railways & Metros (10), Urban Infrastructures (5) and Real Estate (5) located in different parts of India and they are notably in size in terms of revenue and commodity exposure. Considering research heterogeneity requirements, 50 Indian construction project companies were selected to check various commodity risk management parameters for measuring its effectiveness against commodity risk management. The completed questionnaires have been edited for completeness, uniformity and consistency. Study has also included comparative analysis of behaviour of 50 Indian construction project companies.

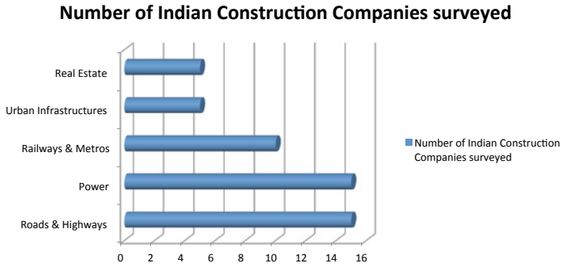

FIGURE 01. *Number of Indian Construction Companies surveyed*

3.3 Research Design

Research design has been structured with a purpose to test various commodity risk management parameters like critical commodity, important issues in manging commodity risk, objective and strategy, contracting strategies, hedging instruments & tenure, hedging policy, commodity risk pass-through to customers, bottleneck in implementing commodity risk management practices and commodity sourcing strategies hedging policy decision and hedging benefits. Respondents of questionnaire survey were from 50 Indian construction companies and they were mainly from various functional areas like procurement cell, hedging cell, finance & account section and operating level employees. Questionnaire survey has been designed considering assumptions like project complexity of selected 50 Indian construction companies being selected from various infrastructure sectors, ease of extracting data from respondents, hedging attributes etc. Main purpose of incorporating questionnaire survey is to collect maximum possible primary data for analysing various research objectives as mentioned; accordingly questionnaire has been prepared after benchmarking with similar studies conducted elsewhere. This questionnaire had 18 operating questions structured to get primary information pertaining to critical commodity, important issues in manging commodity risk, objective and strategy, contracting strategies, hedging instruments & tenure, hedging policy, commodity risk pass-through to customers, bottleneck in implementing commodity risk management practices, commodity sourcing strategies, hedging policy and management policy of companies towards hedging exposure.

The administration of the questionnaire survey was done through multiple channels, which surface mail, e-mail and personal involvement. Questionnaire's questions were tested and analysed by using the Microsoft Excel Spreadsheet and the Statistical Package for Social Sciences (SPSS) along with factor Analysis and correlation analysis was also done, as needed. This study was tested through the use of few basic statistical tools such as percentages, frequencies, averages and ranking method.

4. RESEARCH STUDY FINDINGS AND DISCUSSION

This research has tried to focus on various commodity risk management strategies of 50 Indian construction companies and its effectiveness. It is observed that there are noticeable differences in Indian construction companies' approaches towards commodity risk management practices, both in terms of management's philosophy on isolating the project business from the vagaries of commodities price movements as well as their disciplines in following a particular commodity risk management strategy. In an ideal scenario, Indian construction companies isolate the business from commodity price fluctuations as far as possible and stick to a particular commodity hedging strategy without getting swayed by short-term commodity price movements. However, it is easier said than done in a practical business environment. As per the research observations, it is important to isolate the business from near-term commodity price fluctuations as far as possible given that commodity price fluctuations are unpredictable and should not really be the business manager's focus area. Research has also observed that in the longer term, if the commodity price is moving consistently in one direction, all one can do is to postpone the impact, but business managers then get more time to manage the impact of commodity price.

This research study believes that a consistent commodity risk management policy is important among other things; it provides companies more clarity on what to expect. It is also not the Indian construction companies' aim in the first place to second guess the movement of the commodity price. During the research analysis of 50 Indian construction companies it has been observed that they have adopted different commodity risk management approaches and same is illustrated in terms of summary in **Table 2** as mentioned below.

Commodity Risk Management Attributes	Approach-1	Approach-2	Approach-3
Commodity Hedging Ratio	75% to 100% of project commodity	26% to 74% of project commodity	Not fixed depends on project plan
Involvement of key stakeholders in Hedging policy decision	Project Procurement Cell	Project Planning & Execution Cell	Project Finance & Accounts along with Treasury Cell
Commodity Hedging Tenure	Usually 6 months	6 to 12 months or greater	Not fixed depends on project plan
Commodity Hedging Instruments	Futures	Forwards	Both forwards and Futures, sometimes options
Commodity risk pass-through to customers	In built at the time of project bid price calculation	Fully or partial pass-through in terms of Escalation clause	Not possible due to lack of bidding clause provision
Strategies for forecasting commodity risk	At the time of submitting bid	At the time of receiving order and time of procurement	No fixed timeline and forecasting strategy

TABLE 02. *Summary of Commodity risk management practices adopted by surveyed 50 Indian Construction Companies*

Based on questionnaire survey's data collection and its interpretation following research findings and recommendations can be suggested,

4.1 Construction companies' size and commodity % of revenue in manging Commodity Risk Management

Study has considered two parameters in questionnaire study for their selection purpose in understanding 50 Indian construction companies commodity risk management practices. One parameter is turnover of the construction company in INR billion, while second parameter is share of commodity price in % to construction project firm's revenue. It is observed from **figures 2** & **3** that considering construction companies revenue there are 27 companies having revenue more than INR 10 billion, 10 companies having revenue between INR 7.5 billion to INR 10 billion, 8 companies having revenue between INR 5 billion to INR 7.5 billion and 5 companies having revenue between INR 500 million to INR 5 billion. Interestingly irrespective to construction companies' revenue; commodity price in % to revenue is hovering between 20% to 40% for 37 companies out of 50 studied, between 40% to 60% for 5 companies and 5% to 20% for 8 companies studied. This research observation indicates that Indian construction companies are spending significant amount of their revenue towards commodity procurement hence any volatility in commodity price movement can seriously hamper construction project and financial performance.

4.2 Construction Project Companies' most critical commodity

In an ideal scenario, Indian construction companies' project cost comprises of commodity cost, sub-contracting cost, employee cost, sales and administration cost along with other operating cost. Considering the importance of commodity cost in overall project costing, it is very much essential for construction companies to understand critical commodity which is affecting commodity price and project costing.

Based on data collection of questionnaire pertaining to critical commodity in % based on its impact on project performance it is observed from **figure 4** that cement as construction commodity is 45%, steel is 30%, non-ferrous metal is 20% and other miscellaneous commodity is 5%. Overall, cement as a critical construction project commodity is dominating and same is perceived by studied 50 Indian construction companies as the most critical commodity in terms of its impact on construction project performance.

4.3 Issues faced by Indian construction project companies related to project commodities

Indian construction companies has in recent times, been bogged down by low margins, negative cash flows from operations, rising interest costs on high working capital, execution delays and poor corporate governance. However, unpredictability and fluctuations of commodity prices are regards as an important issue over and above other issues as mentioned above. Based on questionnaire study conducted for 50 Indian construction companies and as per its result interpretation (refer **figure 5**) it is apparent that participants who represents surveyed 50 Indian construction companies have given their opinion in terms of commodity price volatility is 65%, prediction of commodity price & availability from long term point of view is 15%, unpredictability commodity availability is 12% and scarcity of commodity as and when required is 7% as issues being faced by Indian construction companies related to project commodities.

4.4 Commodity risk management strategy awareness of Indian construction companies

Indian construction companies' commodity risk management strategy awareness is still at its nascent stage, the strategic exposure of commodities and its risk management strategy in Indian construction industry is hard to evaluate. In essence, commodity risk management in the Indian construction industry is in its infancy even though most of the companies express an interest in managing commodity risks financially.

Base on questionnaire survey's result (as shown in **figure 6**) on commodity risk management strategy adopted by surveyed 50 Indian construction companies it has given an interesting statistics in terms of commodity risk management process exists uniformly across organisation is 40%, commodity risk management process exists not uniformly across organisation is 30%, commodity risk management process exists once in a while or occasionally is 20% and commodity risk management process being managed on an ad-hoc basis is 10%. Hence from result interpretation it is evident that 40% of respondents feel that commodity risk management process exists firmly across organisation and same can safeguard construction companies against commodity risk.

4.5 Indian construction companies' objective for commodity risk management strategy

Considering commodity price movement and volatility, construction project companies ensures minimum impact of commodity price movement and volatility on project costing along with maintaining project performance in terms of protection of project profitability which was calculated based on certain commodity price during project bidding stage. Main objective behind this questionnaire study point is to understand and analyse Indian construction companies' prime objective for commodity risk management strategy.

As shown in **figure 7**, there are multiple results being derived pertaining to prime objective for commodity risk management strategy and available picture is - safeguarding optimum commodity price as per project bidding price is coming 45%, contributing to the overall project firms objective of limiting commodity risk exposure is 25%, contributing to the overall project firms objective of limiting commodity risk exposure is 15% and ensuring meeting project cost and profit target is 15%. So, the results obtained are quite mixed in nature.

4.6 Involvement of key stakeholders of Indian construction project firms in development of commodity risk management strategy

Effective implementation along with execution of commodity risk management depends on involvement of construction project stakeholders. Usually in Indian construction project companies, internal stakeholders that are most involved in the development of commodity risk management strategy are next to the executive management like procurement cell, finance & account along with treasury (Hedging) cell, project planning & controlling cell and project execution cell etc. In order to understand involvement of key or prime stakeholders in the development of commodity risk management strategy question was asked in questionnaire in terms of "Involvement of key stakeholders of Indian construction project firms" and response in % is indicated in **figure 8**.

As pert the data interpretations it is apparent that involvement of Project Procurement Cell is 45%, Project Planning & Controlling Cell is 25%, Project Execution Cell is 15% and Project Finance & Accounts along with Treasury (Hedging) Cell is 15%. Overall based on results it indicates that commodity risk management strategy is being handled by multiple cells and within that project procurement cell is dominating due to their commodity procurement role.

4.7 Application of contracting strategies for commodity risk management

Main focus or purpose of this analysis is to explore how Indian construction companies handle the contracting of construction project commodities and to what extend several strategies and mechanisms are applied to secure the adequate supply of various project commodities at right price. Based

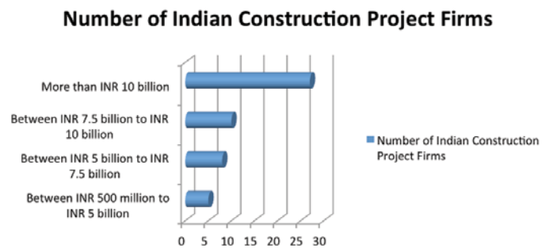

FIGURE 02. *Revenue (in INR billion) wise number of Indian construction project firms*

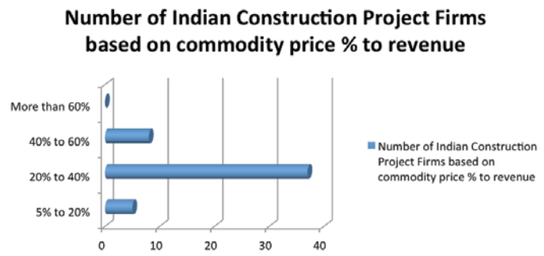

FIGURE 03. *Number of Indian Construction Project Firms based on commodity price % to revenue*

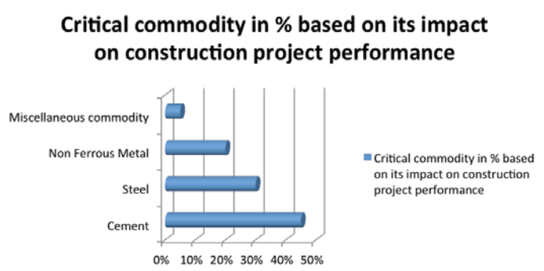

FIGURE 04. *Critical commodity in % based on its impact on construction project performance*

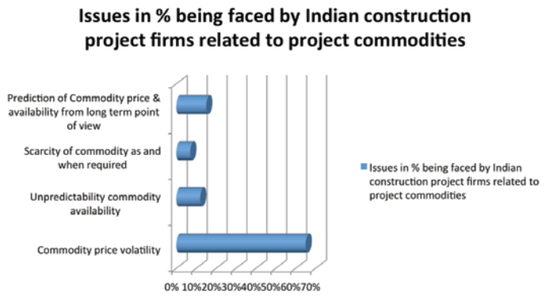

FIGURE 05. *Issues in % being faced by Indian construction project firms related to project commodities*

FIGURE 06. *Commodity risk management strategy in % being adopted by Indian construction project firms*

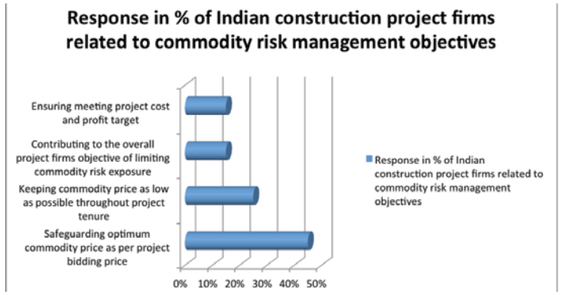

FIGURE 07. *Response in % of Indian construction project firms related to commodity risk management objectives*

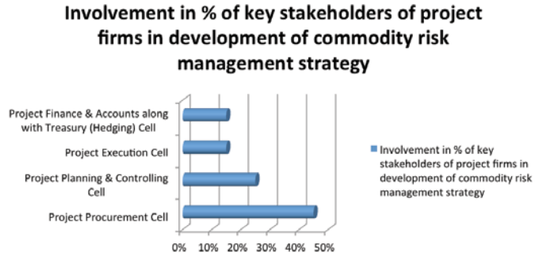

FIGURE 08. *Involvement in % of key stakeholders of project firms in development of commodity risk management strategy*

FIGURE 09. *Application of contracting strategies in % of project firms for commodity risk management*

on survey questionnaire result analysis as shown in **figure 9** it is evident that contracting strategy for commodity risk management - long term contracts with supplier/vendor with market based price is 60%, long term contracts with supplier/vendor with fixed price is 25%, long term contracts with supplier/vendor with collar price is 10% and purchase in the spot market is 5%.

From above result interpretations it is apparent that the long term supplier contract with market based price are applied to significant extent. This type of supply contracting indicates that supply for some of the bulk or special commodity in terms of its volume is secured but the transaction price is determined when the purchase order is placed. Long term contracts with supplier/vendor with fixed price are in use less frequently and finally contracts with collar price are applied less than contracts with fixed price or market price.

4.8 Type of Hedging Instruments used by Indian construction companies for commodity risk hedging

Commodity risk can be usually hedge with various hedging instruments like forwards, futures, options and swaps. Main aim of commodity hedging is to cover a financial risk due to price fluctuations of commodities with an investment in an opposite results. Selection of right hedging instruments (derivative instrument) is always an important element which depends on availability of instrument, market players, tax implications and regulatory requirements.

From **figure 10** it is evident that both 40% of respondents prefers forward and future contract, while options contract is 15% and swaps are 5%. Selection of particular hedging instrument depends on hedging instrument premium, costs and views on the commodity movement. Usually it is observed that, most of the Indian construction companies chose to use particular derivative contracts to hedge each type of risk, due to the individual characteristics of the contracts and the ability to adjust them as needed.

4.9 Selection of Hedging Tenure (time frame - length of contract maturity) for commodity risk hedging by Indian construction companies

Indian construction companies' hedging tenure for commodity risk management depends on several factors like project plan, procurement schedule along with site commodity buffer level requirements and actual timing of using of commodity during project cycle. Main aim of this analysis is to understand from surveyed 50 Indian construction companies' response about linkage of hedging tenure with project life cycle in terms of plan, action and actual application in terms of timing of particular commodity.

As per **Figure 11** it is evident that a majority of the covers taken (hedging tenure) by the Indian construction companies appear to be between 6 to12-month tenure is 45%, 1 to 6-month tenure is15%, 1-2 years tenure is 10% and more than 2 years is 5%. While 25% respondents are not certain about hedging tenure as it depends on project plan. Also, a large proportion of the hedge books appear to be focussed on the immediate quarters. Essentially, this approach protects the business well during a volatile period when the commodity price whipsaws from one direction to another. However, if the commodity price is moving structurally in one direction for a sustained period of time, hedges just postpone the inevitable impact on both the business and financials.

4.10 Selection of Hedging Ratio for commodity risk hedging being adopted by Indian construction project firms

The Hedging Ratio of a company's commodity risk exposure that is hedged being will be often directly related to the predictability of its commodity price movement and related project cash flows. The greater the degree of predictability, the greater the hedging ratio of exposure that is hedged. There is also a direct relationship between the degree to which commodity price fluctuations can impact the bottom line and the percentage of exposures

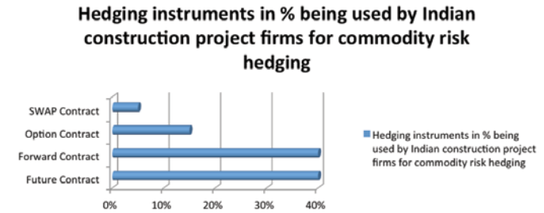

FIGURE 10. *Hedging instruments in % being used by Indian construction project firms for commodity risk hedging*

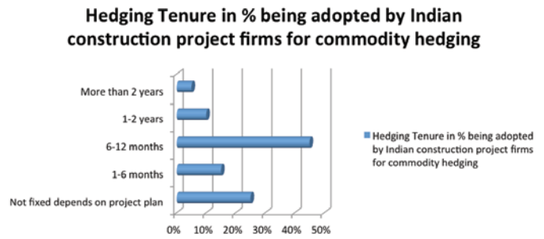

FIGURE 11. *Hedging Tenure in % being adopted by Indian construction project firms for commodity hedging*

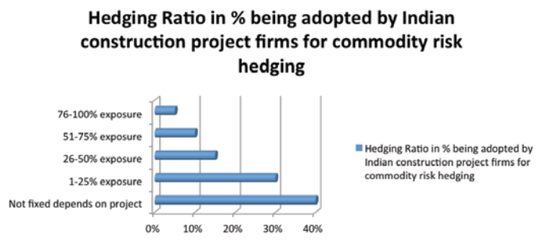

FIGURE 12. *Hedging Ratio in % being adopted by Indian construction project firms for commodity risk hedging*

that are hedged. Hedging ratio for various Indian construction companies depends on their risk taking approach along with timing, for an example Indian construction companies doing international projects usually goes with a maximum 60% hedging ratio during submission of project bids and based on winning chances this ratio goes up. However through result interpretations (refer **figure 12**) it is observed that unfortunately 40% of Indian companies have not fixed hedging ratio, it means unhedged foreign exchange exposure is more venerable towards volatility in foreign exchange markets. Contrary, only 5% of Indian companies prefer 100% hedging ratio means fully hedge of their commodity exposure which shows their alertness to commodity risk.

4.11 Commodity sourcing strategies being adopted by Indian construction companies

After studying contract strategies and hedging mechanism in terms of tenure, ratio and instruments, it is observed that construction project commodities can be also managed through proper sourcing strategies. Just for analysis purpose various options considered to test commodity sourcing strategy are Multiple Suppliers/Vendors, Consortium of Suppliers/Vendors, Vertical Integration and Contracting with Tier-2 Suppliers/Vendors (i.e. contracting plantation).

As shown in **figure 13**, based on data analysis and interpretation for the question on commodity sourcing strategies being adopted by Indian construction companies indicates that majority of Indian construction companies prefers commodity sourcing through multiple suppliers/vendors which is 60% followed by 20% is consortium of suppliers/vendors. While commodity sourcing strategies like vertical integration and contracting with Tier-2 Suppliers/Vendors (i.e. contracting plantation) being preferred by 10% each by Indian construction companies.

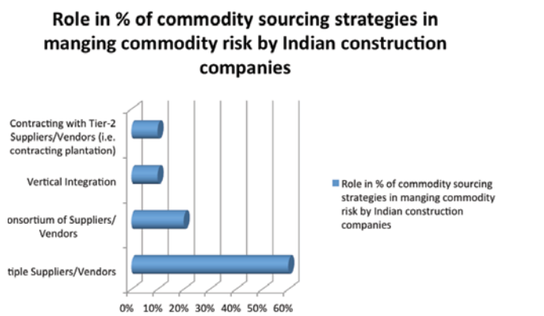

FIGURE 13. *Role in % of commodity sourcing strategies in manging commodity risk by Indian construction companies*

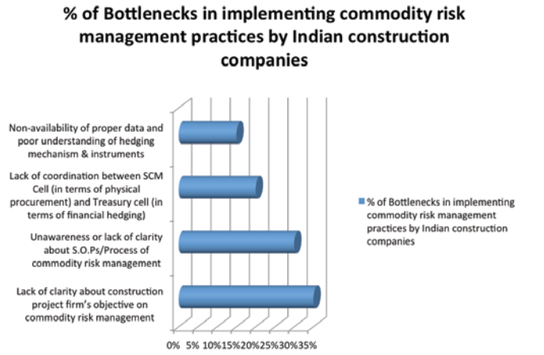

FIGURE 14. *% of Bottlenecks in implementing commodity risk management practices by Indian construction companies*

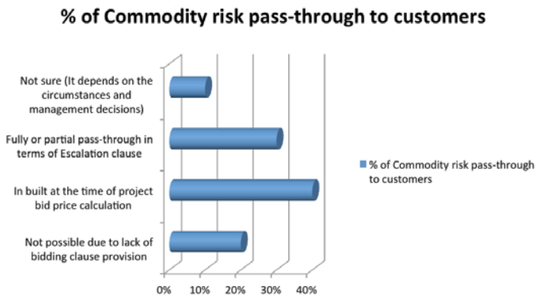

FIGURE 15. *% of Commodity risk pass-through to customers by Indian construction companies*

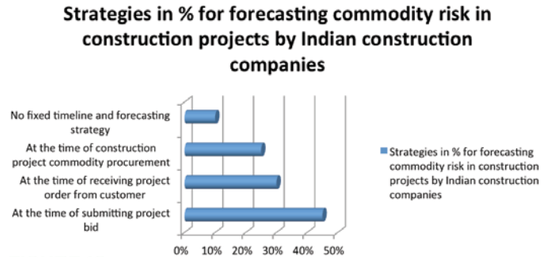

FIGURE 16. *Strategies in % for forecasting commodity risk in construction projects by Indian construction companies*

4.12 Bottlenecks in implementing commodity risk management practices by Indian construction companies

Indian construction sector by nature is not well organised and considering volatile commodity market in terms of price movement and unpredictability there are several bottlenecks can be assumed to remain as stumbling blocks in implementing commodity risk management strategies while doing construction projects in India. Usually based on observations, it is observed that Indian construction companies face several issues in the process of commodity risk via hedging and contracting. In this regard to understand actual scenarios for Indian construction companies, respondents were asked various bottlenecks possibilities based on this study assumptions and understanding.

As shown in **figure 14**, based on data analysis and interpretation for the question on bottlenecks in implementing commodity risk management practices by Indian construction companies indicates that 35% of respondents believe that lack of clarity about construction project firm's objective on commodity risk management as the bottleneck, 30% respondents believe that unawareness or lack of clarity about S.O.Ps/Process of commodity risk management as the bottleneck, 20% respondents believe that lack of coordination between SCM cell (in terms of physical procurement) and treasury cell (in terms of financial hedging) as the bottleneck and 15% respondents believe that non-availability of proper data and poor understanding of hedging mechanism & instruments as the bottleneck.

4.13 Commodity risk pass-through to customers by Indian construction companies

Indian construction companies faces variety of project risk like commodity risk, delay risk, foreign exchange risk etc., among all the risk in some of the projects there is a provision of commodity risk pass-through to customers to safeguard project cost and margins for construction contractors. In order to study scenario of commodity risk pass-through to customers by Indian construction companies various situational based questions like fully or partial pass-through in terms of Escalation clause, in built at the time of project bid price calculation, not possible due to lack of bidding clause provision and not sure (It depends on the circumstances and management decisions) were asked to the respondents to understand how Indian construction companies are using this provision of commodity risk pass-through in their projects.

As shown in **figure 15**, based on data analysis and interpretation for the question on commodity risk pass-through to customers by Indian construction companies indicates that 40% of respondents believe that commodity risk pass-through to customers is in built at the time of project bid price calculation, 30% of respondents believe that it is fully or partial pass-through in terms of Escalation clause, 20% of respondents believe that it is not possible due to lack of bidding clause provision and 20% of respondents believe that they are not sure (as it depends on the circumstances and management decisions).

4.14 Strategies for forecasting commodity risk in construction projects by Indian construction companies

Indian construction companies always facing challenges in terms of timing and strategy for forecasting commodity risk being considered during project life cycle. In order to check various strategies adopted by Indian construction companies while forecasting commodity risk various scenarios were asked to respondents in terms of timing of strategy like at the time of submitting bid, at the time of receiving order from customer, at the time of

construction project commodity procurement and no fixed timeline and forecasting strategy.

As shown in **figure 16**, based on data analysis and interpretation for the question on timing and strategies for forecasting commodity risk in construction projects by Indian construction companies revels that 45% of respondents believes that it is being forecasted at the time of submitting project bid, 30% of respondents believes that it is being forecasted at the time of receiving project order from customer, 25% of respondents believes that it is being forecasted at the time of construction project commodity procurement and 10% of respondents believes that for forecasting there is no fixed timeline and forecasting strategy.

4.15 Impact on financial performance for Indian construction companies of commodity risk management practices

This is one of the most important questions being posed to respondents of 50 selected Indian construction companies to gauge impact of commodity risk management practises on financial performance for Indian construction companies. However, it becomes extremely difficult to predict the impact on the profit & loss statement for any given time, as granular data on the exact hedge book; expiry periods and rates at which hedges are booked pertaining to commodity risk management practices are unknown.

From **Figure 17** it is clear that 40% of Indian companies have noticed noticeable (significant) impact on their financial performance, while 35% feels no significant impact and 25% Indian companies unable to measure impact of commodity hedging on their financial performance. One more observation was observed in terms of adoption of 'AS (Accounting Standard) 30 Financial Instruments: Recognition and measurement'. Consequently, few Indian companies' records MTM (Mark to Market) gains/ losses directly in reserves for all effective hedges designated as cash flow hedges. Other Indian companies routes all gains/ losses through P&L because the disclosure in the company's financial statements states that currently hedges taken by the group are ineffective and hence resultant gains/ losses consequent to fair valuation are recorded directly in the profit and loss account.

4.16 Benefits of commodity risk management practices for Indian construction companies

After studying surveyed 50 Indian construction companies it is observed that the realised rate (at the time of receiving milestone revenue from customers) for the company may be quite different from the purchased rate of particular commodity, if the commodity price movement from the quarter is choppy and not uniform. First, the revenue booking is not uniform across the three months of the quarter and is usually skewed slightly towards the last month which can also sometime create spill-over in the next quarter. Second, companies have different mechanisms of cost booking pertaining to commodity procurement to revenue realisation. This research has tried to focus on measuring benefits of commodity risk management practices as perceived by surveyed 50 Indian construction companies and result is displayed in the below bar chart.

From **Figure 18**, it is observed that overwhelmingly 40% of Indian companies are believing that they have been fully benefited with commodity risk management practices, 25% feels moderately benefited but possibility of improvement, 25% have an opinion that they have been moderately benefited and 15% of Indian companies believes that they have not been benefited by commodity risk management practices for managing commodity risk.

4.17 Areas of improvement for better commodity risk management by Indian construction companies

Main purpose of this research is to understand current scenario and practices being adopted by surveyed 50 Indian construction companies for manging commodity risk along with explore areas of improvement for better

FIGURE 17. *Commodity risk management impact in % on financial performance for Indian construction companies*

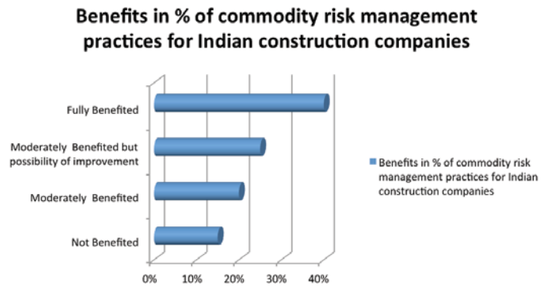

FIGURE 18. *Benefits in % of commodity risk management practices for Indian construction companies*

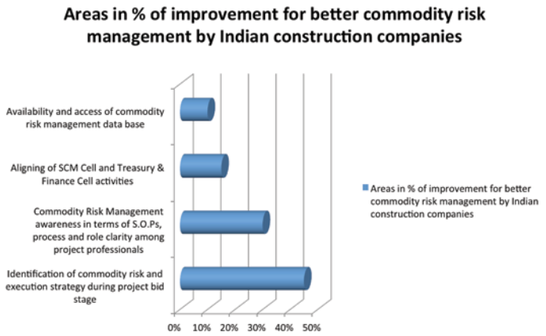

FIGURE 18. *Areas in % of improvement for better commodity risk management by Indian construction companies*

commodity risk management for Indian construction companies. In order to check various possible improvement areas/options for better commodity risk management by Indian construction companies various possibilities were asked to respondents in terms of identification of commodity risk and execution strategy during project bid stage as one area, commodity risk management awareness in terms of S.O.Ps, process and role clarity among project professionals as second option, aligning of SCM cell and treasury & finance cell activities and availability and access of commodity risk management data base as third and fourth options respectively.

Based on responses gathered from surveyed 50 Indian construction companies as shown in the **figure 19** it is quite evident that 45% respondents believe that Identification of commodity risk and execution strategy during project bid stage could be an improvement area for better commodity risk management, 30% respondents believe that commodity Risk management awareness in terms of S.O.Ps, process and role clarity among project professionals could be an improvement area for better commodity risk management, 15% respondents believe that aligning of SCM Cell and treasury & finance cell activities could be an improvement area for better commodity risk management and only 10% respondents believe that availability and access of commodity risk management data base could be an improvement area for better commodity risk management.

5. CONCLUSION AND RECOMMENDATIONS

Indian construction companies are exposed to many forms and degrees of uncertainty and project risk, such as commodity risk, foreign exchange risk, delay risk, price commodities volatility and shocks. Commodity price uncertainties are pervasive throughout the project lifecycle, occurring at project initiation and continuing through execution. Commodity risk management is a multi-stage process which starts with project bidding & proposal stage in terms of identification of commodity risk exposure, which is then monitored, quantified and corrective action taken on daily, weekly or monthly basis to ensure that risk profile of the firm remains aligned with the objectives of commodity risk management practices.

Based on the result interpretations of this research study it is evident that commodity risk management is an integral part of the surveyed 50 Indian construction companies. Main objective of this research was to identify how Indian construction companies manage and practices for manging project commodities in terms of price variations and volatility throughout project life cycle. This study has focused and analysed 50 Indian construction companies' commodity risk management scenario and practices and findings are depicted as below.

- Surveyed 50 Indian construction companies spends 40% to 60% of project revenue towards commodity cost and among the widely used commodities is cement, steel and non-ferrous metal.
- Major issue faced by surveyed 50 Indian construction companies in commodity dealings are commodity price volatility, unpredictability of commodity availability along with difficulty in prediction of commodity price and availability from long-term point of view.
- In terms of commodity risk management strategy, survey indicates the mixed picture as 40% respondents believes it exists uniformly across organisation, 30% respondents believes it exists not uniformly across organisation and remaining 20% and 10% respondents believes that it exists once in a while or occasionally and being managed on an ad-hoc basis respectively.
- Prime objective of commodity risk management strategy is to safeguard optimum commodity price as per project bidding price, keeping commodity price as low as possible throughout project tenure along with contributing to the overall project firms objective of limiting commodity risk exposure and ensuring meeting project cost and profit target.
- Project procurement cell and project planning & controlling cell does involves as key stakeholders in the development of commodity risk management strategy.
- Long term contracts with supplier/vendor with market based price and with fixed price being used as contracting strategies for commodity risk management followed by contracts in collar price and spot market purchase.
- Forward and Future contracts are most preferable hedging instrument for mitigating commodity risk of surveyed 50 Indian construction companies.
- Average hedging tenure for exercising forward or future contract is 6-12 months.
- Surveyed 50 Indian construction companies seems to be undecided in quantifying underlying commodity exposure as it various from 1% to 75% which is the most important concern while performing commodity hedging.
- Surveyed 50 Indian construction companies prefers multiple suppliers/vendors along with consortium of suppliers/vendors as commodity sourcing strategies.
- In terms of various bottlenecks in implementing commodity risk management practices, available results are mixed as it varies from lack of clarity about construction project firm's objective on commodity risk management, S.O.Ps/Process of commodity risk management to lack of coordination between SCM Cell and non-availability of proper data and poor understanding of hedging mechanism & instruments.
- While in commodity risk pass-through to customers, majority of respondents believes that it is in-built at the time of project bid price calculation along with fully or partial pass-through.
- In terms of strategies for forecasting commodity risk in construction projects by Indian construction companies, result varies from at the time of submitting project bid to at the time of construction project commodity procurement, which indicates there is no definite strategy is placed for forecasting commodity risk in construction projects.
- Indian construction companies started realising benefits of commodity risk management practices in terms of moderately to fully benefit.
- Regarding areas of improvement for better commodity risk management; Identification of commodity risk and execution strategy during project bid stage, awareness in terms of S.O.Ps, role clarity and data access along with aligning of SCM Cell and treasury & finance cell activities are some of the areas have been emerged based on surveyed result analysis.

Hence based on findings, research study recommends (in terms of research contribution) effective risk management practices and strategy for suitable commodity risk mitigation in terms of price fluctuations and volatility in terms of proper selection of hedging instrument, tenure, ratio along with standard processes and risk pass-through to customers along with contracting strategies with multiple vendors.

Out of surveyed 50 Indian construction companies, most companies have traditional approach where commodity sourcing is by far the most important perspective in defining commodity risk mitigation strategies. In an ideal scenario, Indian construction companies should isolate their project business from commodity fluctuations as far as possible and stick to particular commodity risk management strategy like hedging, contract sourcing etc. without getting swayed away based on short-term commodity price movements. Research observations suggest isolating project business from near term commodity price fluctuations as far as possible given that commodity price fluctuations are unpredictable and should not really be project execution manager's focus area. The study has also observed that if in a longer time-frame commodity price movement follows a particular pattern then project managers can postpone the impact but at the same time project procurement cell/ hedging cell get more time with stop loss strategy to manage impact of commodity risk on project business.

Main recommendation of the research paper is that consistent commodity hedging along with contracting strategy is paramount important for Indian construction companies among other things, as it provides construction companies more clarity on what to impact. It is also not the Indian construction companies' aim in the first place to guess the movement of commodity price.

Limitations and Scope for future research: However, like every research study, this research study also has certain limitations. Data collected in the form opinion/information gathered through questionnaire survey tool can act as a mild limitation for the study in the terms of its reliability. Based on research study of 50 Indian construction companies findings, it is suggested that future research may focus on commodity risk management practices adopted by other Indian companies, especially infrastructure sector companies who are extensively using project inputs mainly commodities/raw commodities should be consider as future research area.

APPENDIX: QUESTIONNAIRE FORMAT

1. Construction project firm's turnover
   a. Between Rs.50 crore to Rs.500 crore
   b. Between Rs.501 crore to Rs.750 crore
   c. Between Rs.750 crore to Rs.1000 crore
   d. More than Rs.1000 crore
2. Commodity cost in % revenue for Indian construction companies
   a. 5% to 20%
   b. 20% to 40%
   c. 40% to 60%
   d. More than 60%
3. Most critical commodity based on its impact on construction project performance
   a. Cement
   b. Steel
   c. Non- Ferrous Metal
   d. Miscellaneous commodity
4. Issues faced by Indian construction project companies related to project commodities
   a. Commodity price volatility
   b. Unpredictability of commodity availability
   c. Scarcity of commodity as and when required
   d. Prediction of Commodity price & availability from long term point of view
5. Commodity risk management strategy of Indian Construction companies
   a. Commodity risk management process exists uniformly across organisation
   b. Commodity risk management process exists not uniformly across organisation
   c. Commodity risk management process exists once in a while or occasionally
   d. Commodity risk management process being managed on an ad-hoc basis
6. Prime objective of Indian construction project firms' commodity risk management strategy
   a. Safeguarding optimum commodity price as per project bidding price
   b. Keeping commodity price as low as possible throughout project tenure
   c. Contributing to the overall project firms objective of limiting commodity risk exposure
   d. Ensuring meeting project cost and profit target
7. Involvement of key stakeholders of Indian construction project firms in development of commodity risk management
   a. Project Procurement Cell
   b. Project Planning Cell
   c. Project Execution Cell
   d. Project Finance & Accounts along with Treasury Cell
8. Application of contracting strategies for commodity risk management
   a. Long term contracts with supplier/vendor with market based price
   b. Long term contracts with supplier/vendor with fixed price
   c. Long term contracts with supplier/vendor with collar price
   d. Purchase in the spot market
9. Type of Hedging Instruments used by Indian construction companies for commodity hedging
   a. Future Contract
   b. Forward Contract
   c. Option Contract
   d. SWAP Contract
10. Selection of hedging tenure (time frame - length of contract maturity) for commodity risk hedging by Indian construction companies
   a. Not fixed depends on project plan
   b. 1-6 months
   c. 6-12 months
   d. 1-2 years
   e. More than 2 years
11. Selection of hedging ratio for commodity risk hedging being adopted by Indian construction project firms
   a. Not Fixed depends on project plan
   b. 1-25% exposure
   c. 26-50% exposure
   d. 51-75% exposure
   e. 76-100% exposure
12. Commodity sourcing strategies being adopted by Indian construction companies
   a. Multiple Suppliers/Vendors
   b. Consortium of Suppliers/Vendors
   c. Vertical Integration
   d. Contracting with Tier-2 Suppliers/Vendors (i.e. contracting plantation)
13. Bottlenecks in implementing commodity risk management practices by Indian construction companies
   a. Lack of clarity about construction project firm's objective on commodity risk management
   b. Unawareness or lack of clarity about S.O.Ps/ Process of commodity risk management
   c. Lack of coordination between SCM Cell (in terms of physical procurement) and Treasury cell (in terms of financial hedging)
   d. Non-availability of proper data and poor understanding of hedging mechanism & instruments
14. Commodity risk pass-through to customers by Indian construction companies
   a. Not possible due to lack of bidding clause provision
   b. In built at the time of project bid price calculation
   c. Fully or partial pass-through in terms of Escalation clause
   d. Not sure (It depends on the circumstances and management decisions)
15. Strategies for forecasting commodity risk in construction projects by Indian construction companies
   a. At the time of submitting bid
   b. At the time of receiving order from customer
   c. At the time of construction project commodity procurement
   d. No fixed timeline and forecasting strategy
16. Impact on financial performance for Indian construction companies of commodity risk management practices
   a. Noticeable Impact
   b. No Significant Impact
   c. Not Measured
17. Benefits for Indian construction companies of commodity risk management practices
   a. Not Benefited
   b. Moderately Benefited
   c. Moderately Benefited but possibility of improvement
   d. Fully Benefited
18. Areas of improvement for better commodity risk management by Indian construction companies
   a. Identification of commodity risk and execution strategy during project bid stage
   b. Commodity Risk Management awareness in terms of S.O.Ps, process and role clarity among project professionals
   c. Aligning of SCM Cell and Treasury & Finance Cell activities
   d. Availability and access of commodity risk management data base

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