

Managing Material Cost in Construction Projects

Abrar Ul Hassan¹ and Er. Sakshi Bhatia²

¹M. Tech Scholar, Department of Civil Engineering, RIMT University, Mandi Gobingarh, Punjab, India

²Assistant Professor, Department of Civil Engineering, RIMT University, Mandi Gobingarh, Punjab, India

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ABSTRACT- In the development of project budget cost estimation of construction material is considered one of the fundamental important functions. To mollify the risk of material price volatility, material hedging concept is another idea reducing unpredictability. This research coordinated application of fuel hedging with hedging of material used by carrier like airlines. Utilization of weather hedging as a point of reference for construction material supporting application of hedging in the industry of construction. A guidance is provided by this thesis to apply material hedging with data and numbers from the practical use. In addition to this, this postulation coordinated the model introduced by Macdonald (2013) with this research model and gave a detail which is of less level in detail to help real execution of hedging material. In order to look into the feasibility of hedging material application more work, research and investigation needed to be carried out. Feasibility of material hedging and its application can be known by carrying out investigation in this area. Investigation of reliability and validity of this thesis model, in order for its application should be carried out so that appropriate facts can be put forth and used.

KEYWORDS- Cost Estimation, Gross Domestic Product, Engineering News Record, Engineering and Construction, Hedging Sources.

I. INTRODUCTION

In the budget development of any project cost estimation is considered most important and essential task of construction project. Many levels of vulnerability, danger and degrees of uncertainty are exposed to construction projects such as price fluctuations of materials. Throughout the project initiation and termination uncertainties of material price occurring on project life cycle are extensive. Thus, further examination to assess new procedures and techniques to decrease the danger and risk of fluctuations in material price is required. For economic improvement and expansion construction sector and activities are primary source. The construction area and exercises are viewed as one of the significant wellsprings of monetary extension and improvement. With regard to this the construction area is viewed as the top area for rousing work. The business openings that the construction sector gives are viewed as a support of the general public since it benefits the more youthful and lower talented laborers, who have less elective open positions. Numerous urban communities are vigorously reliant on industry of construction to give a critical lift to their well-being of economy[1].

Yield from the construction industry is a fundamental piece of the public yield. By representing a large portion of GDP (Gross Domestic Product) in between 6 percent to 10 percent of both created and immature nations, the industry of construction significantly affects individual profit and creation and supporting of employment. Organizations all through the financial system are reliant on presentation of infrastructure (physical), for example, streets, air terminals and power stations, and media communications to stay serious. The nature of physical or material infrastructure could be a significant thought for internal financial specialists in their area choices[2].

A. Industries of Construction with Cost Estimation

For what reason do extend costs appear to consistently go over underlying assessment? The response to this inquiry is a consequence of numerous elements, primarily helpless expense assessing rehearses. Venture cost assessment is viewed as one of the main assignments in the advancement of an undertaking financial plan. Be that as it may, because of material value vacillation, cost assessment is typically dubious. Conventional cost assessment strategies need exactness, particularly in achievability or evaluation stages. The current expense assessing techniques can be summed up as follow

- Index Number Estimate: In this method national price index is multiplied by original construction cost of the present structure which is optimized to conditions mainly local like material costs, toil expenses and weather).
- “Cost per Function Estimate”: Costs per unit of use and its parameter form basis of this method.
- Unit Area Cost Estimate: Unit Area Cost Estimate is commonly used in home constructions which uses an estimated price for every unit which is calculated from gross floor area[3].
- Cost Estimate of Unit Volume: The basis of Unit Volume cost estimate method is the total volume enclosed and its approximation cost for every unit of it.
- Parameter with its Cost Estimate: Cost with this estimate includes boundary costs, for every one of a
- few diverse structure parts or frameworks. This strategy depends on measurements or amounts of work encased.
- Takeoff Estimate (Partial): With this examination utilizes amounts of significant work things that is extracted well versed from incomplete plan records. After this these are valued utilizing assessed unit costs for every work thing utilizing the RSMMeans information base.
- Panel Unit Cost Estimate: Cost estimate of this type uses

analysis which is based on unit cost per square unit area of floors, unit roof area and unit length of wall.

- Reed Business Information has division RSMMeans. RSMMeans gives a cost assessment information base that assists contractual workers with ascertaining the expenses of construction preceding starting construction, and give precise evaluations to their undertaking costs of . Hence, improvement can be done by RSMMeans in the contractual workers' dynamic, limit danger and save time. This cost assessment information base is refreshed yearly and is accessible on the web, by means of DVD, or simple book shape and its utilization by proficient assessors for state-of-the-art work, overhead and medium expenses for explicit undertaking types and areas. According to "RSMMeans is North America's most construction cost recognized database". The issue with utilizing RSMMeans is it isn't generally precise for the market or task types. RSMMeans relies upon normal qualities. Except if the venture numbers are actually equivalent to the normal information utilized in the aides, the numbers don't generally create precise outcome).[4]

Cost estimation indices sources are many but one popular is Engineering News Record (ENR). Two types of indices are in ENR: Building cost index (which is used in industrial and commercial) and construction cost index (which is used in residential purposes). These indexes both have labor and material component. ENR has reporters of regional price in more than 20 United States cities who verify local prices. The costs are cited month to month from similar providers every month for the entirety of the materials in the files. ENR doesn't utilize normal qualities while the ENR correspondents assemble "spot costs" within one hotspot for the entirety of the resources followed . Despite the fact that ENR may viewed as a superior cause that RSMMeans mutually don't mirror material value unpredictability issue[5].

B. Risk Aspect of Construction Estimation

One very important management process in construction project is managing risks. Company's success is greatly affected by ineffective management of prices and highly volatile prices of raw material. Current significant development ventures include long period of work which increment the danger of value change in material with time. With material price fluctuations as material price change with time ongoing major construction projects involve in many years of exertion risk. The expansion of instability in construction material value prompts monetary danger and might bring about corporate disappointments. Various methodologies have been tried by the E&C (Engineering and Construction) to report risk. Most existing methodologies for substantial danger evaluation are inescapable which implies that they handle factors, for example, cost as though they were fixed. Notwithstanding, in actuality material cost varies all over. Probabilistic methodologies measures variety by utilizing dispersions rather than fixed qualities in danger evaluation. A circulation characterizes the scope of conceivable cost esteems, and shows which esteems inside the reach are the best bet. Mulling over the full scope of conceivable cost results can improve dynamic about material dangers. To manage risk there is another way of simulation optimization. The term optimization can be explained in

general minimizing risk for a specific outcome and maximizing the desired outcome. . In this regard outcome of a decision is explained by probability distribution under certain risk. Under danger decision making can streamlined utilizing the normal worth basis during which options are contrasted with distinguish the elective that boost anticipated benefit or limit cost[6].

The insurance and indemnification arrangements are essential danger moderation gadgets in any construction contract. These arrangements commit the gathering with less haggling capacity to safeguard the other against specific dangers. These authoritative arrangements could assist the two gatherings with distributing materials hazard and different dangers legally . Nonetheless, they can't address unanticipated conditions that influence pricing of materials . The existing methodologies for risk appraisal don't reflect value unpredictability issues. The construction organizations have been delayed to understand the possible advantages of new strategies in risk the executives. Rate acceleration of construction activities can be characterized as the deviance of initial and concluding project costs estimates. One of the primary factors is materials value fluctuation that form basis for cost heightening in building ventures. By distinguishing and scheming cost acceleration drivers building organizations can improve quotes and estimates.

C. Price Fluctuation of Material

From complete expenses of a task construction materials may envelop 50-60% whenever joined with different service for example equipment's . Project cost is greatly impacted by material, when left unmanaged. Throughout project lifecycle, occurring from initiation to termination material price fluctuation are extensive. Project costs driver are instabilities of material prices which in itself are unstable. Unpredictability is a proportion of the sum and speed of cost changes, whether or not it is a monetary increment or diminishing. This is significant in light of the fact that price accelerations may happen, but since price changes additionally conceivably sway assets distribution and task choice[7].

Suppliers are profoundly influenced by extreme expansions in expense of crude materials, particularly when they take on deeds on fixed value contracts. At the point when cost of material increments essentially throughout a task, both the clients and the contractors are contrarily influenced. Contractors can end up confronting significant misfortunes and users bear the dangers of contractor either leaving business approximately at center of the agreement, or attempting to supply bad quality material to beat burdens. Verifiably, crude material costs regularly just climbed.

A director was entrusted with assessing the pace of the expansion and timing his requests to advance beyond the value climbs. By and by, costs for key crude materials change here and there, and it very well may be a basic error to take conveyance not long before fall of costs. For instance, in Fig 1 and as per the U.S. Authority , the PPI (Producer Price Index) shows that steel and concrete value used to rise (in one heading) till the mid 90's. From that point forward, the cost of materials began to vacillate. A more critical look on the PPI for steel, black-top, concrete and wood and shows the seriousness of material value

vacillation somewhere in the range (U.S. Department of Labor Statistics)[8].

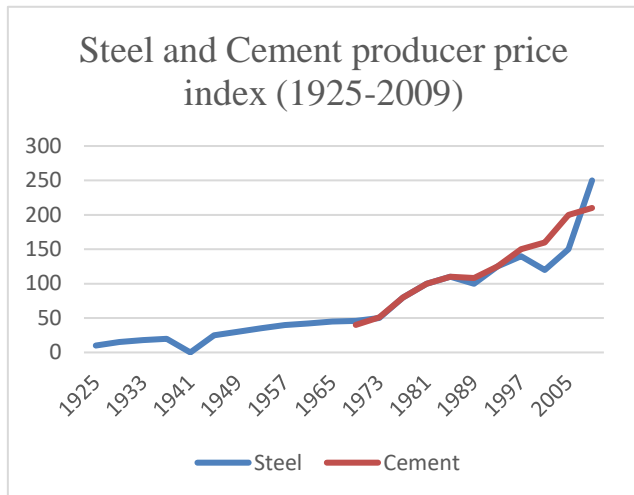


Figure 1: Price Index of Steel and Cement

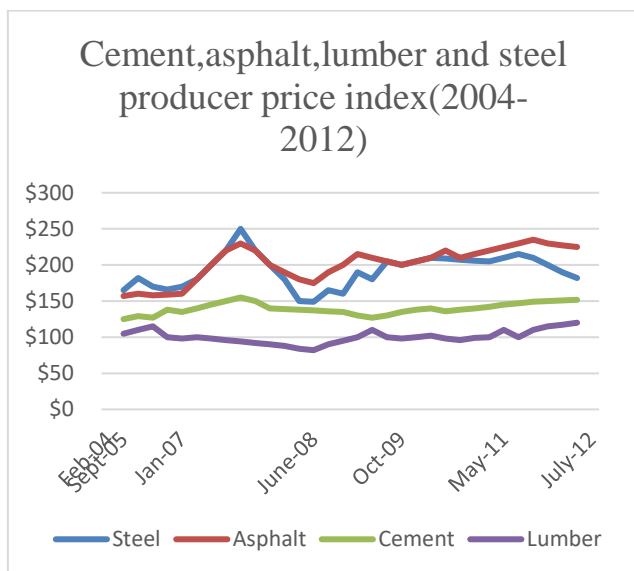


Figure 2: PPI of Steel, Cement, Asphalt, and Lumber

A contemporary subject matter of contractor communicate is the ever-moving charge of creation substances. In figure 2 show Changing substances charges can reason actual demanding situations for the development enterprise when figuring out costs).

II. RELATED WORK

Derivatives and its uses for hedging material risk has limited knowledge and with it very small portion of investigation has been done for applying in the construction organization weather hedging. Considerable studies have been done in hedging of airline fuel. The impact in industry of construction for achieving financial objectives by using weather hedging has many benefits but little research has focused on it. E&C (Engineering and Construction) industry was proposed by a model which was developed and presented by Macdonald by using financial derivatives for reducing material price fluctuation risks[9].

A. Methodology

For any academic research to carry out search and assessment with evaluation that too with systematic approach of past literature is an important part of it. By lack of decent and well-developed literature review, study in the engineering field has suffered a lot. Defining in the Hart language it can be defined as idea in literature which defend a precise method to topic with its methods of selection and demonstration that this present research is a part of something recent. Taking help of database in electronic form and using computers, literature search now a days is carried. Information in massive quantities and its search is carried by accessing computer database which is less time consuming and retrieve information more swiftly with less labor than the search performed manually[10]. Electronic databases dealing with particular field of information are used. Identification of literature is done by keyword searches which is most common method. The main principle which is followed for whether a specific publication should be included in research review or not is defined by the type of source. Following resources of particular search were used:

- Library from ASCE (American Society of Civil Engineering)
- Database of Elsevier Science
- Library which is available on Wiley online
- Catalogue which is provided online on The University of Alabama.
- Website of Mercatus Energy Advisor.

B. Financial Hedging and its Course of Nature

A hedge may be defined as the position in investment projected to nullify possible losses that may occur by investment made by company. The other term is derivative which can be defined as contracts whose value is obtained from one or more than one variable known as underlying asset. Large part of worldwide oil market of oil firm's operation is formed by combining (options, futures, swaps, forwards) with derivatives of hedging. In order to sell or buy at a fixed price in future both future and forward contracts arrangement are used. Option is another type of derivative which is used[11]. Two types of options are there: puts and call. Without giving any obligation to buyer, right is given by the option to buyer, to sell or buy some amount of asset underlying before a future date or at agreed price. After these derivatives, swap is last type of derivative. Forming a base with the help of agreed formula futuristic exchange of cash flow are done by Swaps which are private arrangements.

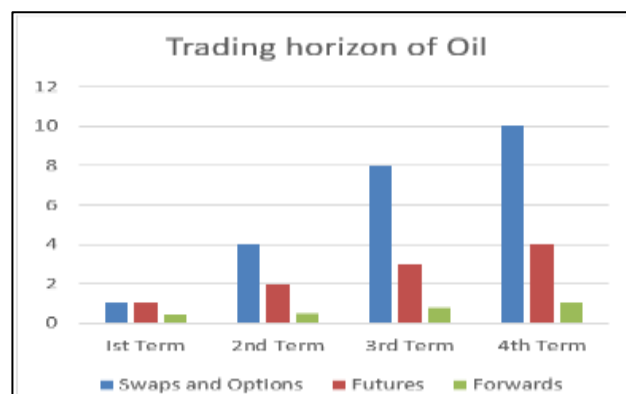


Figure 3: Trading horizon of oil

As from above figure3 it is mentioned that contracts are of three types. One is short term contract for a time period of one year which is forward contract. The other is medium term which is of upto 5 years known as future contracts. And last is of period upto 10 years options and swaps known by long term contract. As far as hedging strategies are considered regardless of type of derivative, company can use four main strategies for hedging:

- Hedge ration in Dynamic: It is dynamic version of hedge ratio optimal in which updation of variance, covariance and trading opportunity are considered.
- Hedge ratio at optimal: Forming the basis from ratio which is obtained from future contract price and its variance and covariance. Number of contracts which needs to be purchased at start of hedging is determined from this.
- Hedging strategy (Naive): In Naive hedging at start of hedging period a future contract is bought and after that within specific time it is closed.
- No hedging
- Cost effectiveness and financial risk are some key factors that can be established by using these derivatives. High cost of hedging is due to the fact that hedging requires expertise with vast experience and high amount of knowledge of specialist in finance. According to the suggestion by researchers' avoidance of risk by derivative is not only for institute of finance but can also be to other organizations. Literatures conclude that hedging has been used for many like transportation but quite substantial amount of information can be found in industry of airline[12].

C. Industry of Airline with its Hedging Application

For a long time in the airline industry hedging of fuel has been very well practiced. Because of instability of fuel prices is one of the main reasons for hedging as it fixes the cost of fuel and other expenses. In order to cover the other cost firm/agencies uses fuel hedging. Of the total operating cost by the airline firm around 10-20% is covered by jet fuel. To exemplify it, for every dollar increase in jet fuel cost there is annual increase of around 420 million dollars for airline companies. Apart from other commodities, jet fuel price is unstable up to very high level. Instability levels are enormously variable. The other reason for fuel hedging is that the increase in fuel price can't be transferred to passengers which is more difficult as purchasing of tickets are done way before actual increase in cost of fuel. The time between the two i.e., service of air travel delivered and increase in fuel cost is very large.

Both risk and benefits to organizations which are generated by hedging are part of strategy of risk management policy by corporate. Various studies have been conducted regarding the behavior of hedging in airline industry and it has been found that the hedging of fuel on airlines and its impact is unsettled empirically issue. Core relation was obtained between operating income and hedging. The study conducted by the Rao which indicated that quarterly income of tax by medium airline (1980 to 1990) generated can't be predicted with hedging e.g., in the airline industry south line airlines is mentioned as successful hedger.

D. Industry of Construction with its Application by Using Hedging

The current application with regard to construction companies is using the weather derivative as it adds value to company / organization.

E. Application of Weather Hedging

In order to insure against the effect which, occur due to the changes in the weather, companies use weather derivatives. Eron Corporation in 1997 was the first to use the weather derivative. The study was conducted by WRNA (Weather Risk Management Association) and according to that in the year 2011 around 11.8 billion dollars was traded using the weather derivatives which was about as compared to previous year 20 percent higher. In construction companies' concept of weather derivative has been recently introduced. During the period when construction work cannot be performed outside because of bad weather and rain, construction companies use the concept of weather derivative to avoid losses. Monitoring of weather-by-weather prediction services (paid or free) can be used by the construction organizations but their reliability is minimum which in turn does very little to minimize any impact weather. The risk which may occur during construction because of extreme rain can be avoided, managed, mitigated by construction organizations using by the derivative. Trading of these type of derivatives can be done in many ways. OTC, Over The counter are the primary market trade which means that direct trading is incurred between banks and construction organizations.

Weather derivative can be defined by several elements of which the first is indication of weather station, the function of which is that it can be used as reference location for hedging as weather hedging. After this the weather index is the second element which explains how the contracts payout will occur with the ruling degree of weather. Following the above the third element is the period the period according to which index is designed. The fourth element is (swaps, puts and calls) which are known as weather derivative structure. At last premium is the final element which can be very well defined as the quantity for amount which is paid by the buyer and is usually in between 10-20 percent of contract amount.

F. Hedging in Construction Material

Hedging for reducing material price fluctuation by using derivatives is done but less knowledge is established in this field. In order to reduce price fluctuation of material by using hedging tool a paper was published in 2013 by Macdonald. In his research he brought forward material price fluctuation problem in projects related to construction and to reduce its risk Macdonald provided his overview on it. Macdonald research included risk reducing strategy like addition of contingencies or additional financial reserve. Based on her research she concluded that prevailing financial solutions were not enough because they didn't considered volatility of material price. By using the financial derivative which can be used in industry of construction a model was developed by Macdonald for reducing the risk from material price fluctuation. The research conducted by Macdonald suggested that hedging should be used for reducing the risk but not as some sort of profit earning tool[13]. Macdonald's model consisted of various stages which are shown in fig.4

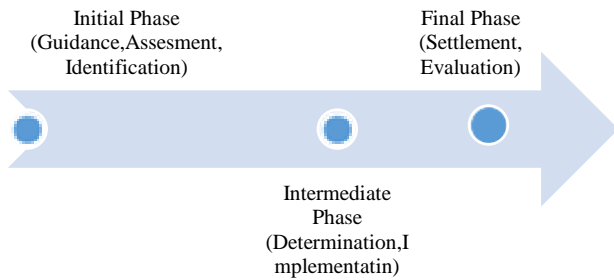


Figure 4: Macdonald's model

In order to show positive impact of derivative usage on projects Macdonald simulated her model using these projects. Projects are unique and have different duration that too in construction project. If hedging is useful regardless of project duration or commodity for that MacDonal used simulation. With this regard Macdonald showed that hedging mitigated the risk of escalating costs regardless of the project type, duration and material used. With respect to cost of hedging Macdonald model didn't took this into consideration. In addition to this no guideline or more accurate practice or procedure were mentioned in Macdonald model for implementing of hedging in modern construction industry. Best practice is that practice which shows better results than previous ones.

III. METHODOLOGY

A. Procedure

Airline fuel hedging is a recent field and to identify best practices this paper made use of two basic criteria. In these criteria the first is criteria of quantitative. In this research the first criteria considered for the hedging practice which showed consistent results. Investigations in this regard showed that the use of this practice had been for a long time which showed same results time after time. The same hedging practice identified has the best practice in airline industry and for this research eight main research articles are used to carry forward this research. The qualitative aspect is considered as a second criteria. The paper looked for the practices in the second criteria that has direct effect on the observations. Result shows that the practice has direct relationship. To exemplify and show application in this regard a model of company is elaborated. Swaps are used by company as a hedging tool and this results in effective hedging, the technique of swaps has a straight forward association with the observation.

Fuel hedging performance is one of the main and important on ground application. Regarding this an investigation was found and used in this research which was of twenty-seven firms in airline of U.S industry between the period of 1994 to 2001. A positive relation among value upsurges in investment and specific hedging tools was found. In this regard only one criterion of qualitative was met. Regarding the authenticity and reliability of this research involved hedging techniques for a period of seven years of U.S airline industry. For considering as a best practice the hedging practice should meet all criteria.

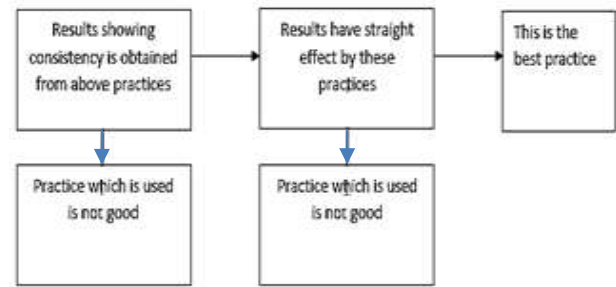


Figure 5: Method to adopt to determine the best practice

In fig 5 research the first step was to bring forward and to look into literature regarding practice of hedging in the industry of construction and airline. With the help of using keywords this literature investigation was carried forward example industry of airline hedging practice, industry of construction hedging and hedging. The second step was to bring forward and to look into techniques of hedging in the industry of airlines. This guideline identified top practices used in qualitative and quantitative criteria (Figure). To meet the quantitative aspect eight study articles has been looked and regarding the qualitative feature one study has been spotted. In order to gain the information regarding hedging various major airline companies were contacted. In this regard the first information was collected by the researcher from the director (Public relation) [Southwest Airline Ms. Linda Rutherford). Some information and questions were put forward and asked about policy of hedging. But due to the privacy and company policy no information was collected as MS. Rutherford denied the same.

This investigation and research were carried forward and third step was involved regarding weather hedging techniques and their application in the construction industry. The third step provided a back-to-back rule for derivative application in the industry of construction. In the engineering construction weather hedging has been one of the top discussed articles and the number of web articles are on it. But for a research one main and primary research article was investigated which included construction industry weather hedging. Information and knowledge of this article was a basic key and back bone of this investigation due to minimum information about hedging application in industry of construction. This investigation and research were carried forward and four step was involved regarding application knowledge extracted from step two and three. To make a guideline for applying material hedging successfully in the industry of construction above steps are used.

The step fifth combined model with material hedging developed in this thesis. Research made elaborated steps for this application and provided a basic intuitive about hedging in material application. The last and foremost step was providing recommendations and conclusions for futuristic research direction.

B. Best Hedging Practices in the Industry of Airline

Best practices indication was provided only by eight articles out of the literature research conducted. Mercatus Energy Advisors article was one of the first article. Mercatus Energy Advisor conducted a survey of 24 global airlines executives in 2012. In the survey of Mercatus

survey the participants stated that they have previously/currently utilized various structures and instruments of hedging. It has been found that the major chunk of airlines is either involved or using call options, collar options and fixed price swaps, these derivatives are seen favored in the industry of airline as hedging instruments. The survey which was conducted in 2014 by Mercatus it was seen that the range of futures only 3 percent of companies were involved on the other hand swaps were used by 39 percent. The other derivative which is the call option only 29 percent companies use them. Further in regard of collar options and forwards only 26 percent and percent companies were involved respectively[14]. suggested 24 commercial airlines are using instrument of hedging which is shown in the figure 6

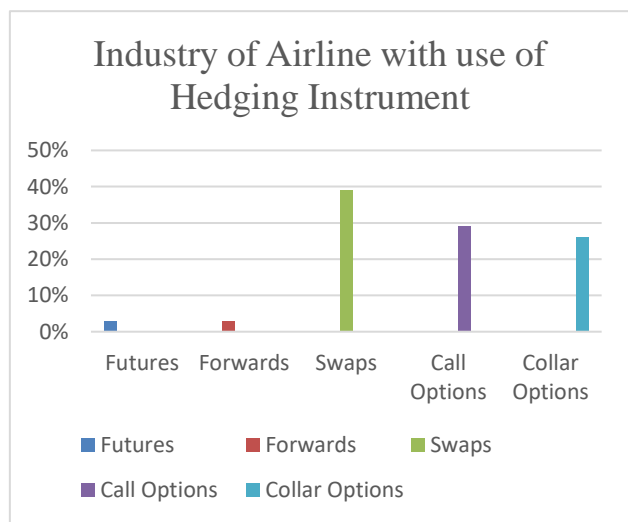


Figure 6: Industry of airline with use of hedging instrument

The result which was obtained by the same result was obtained by , Rogers and Carter when they did same study on the airline industry. , Rogers and Carter in this regard stated that primary derivative used by airline are call option by airline industry, since it takes care of fluctuation in fuel price hike. To protect themselves from price hike movements options are more advantageous than futures giving holder more ability to protect themselves and giving the participants a conducive and favorable moment at the same time. The below mentioned figure 7 is an example of protecting 1.20 dollar per gallon of fuel by making use of call option.

Fuel price fluctuations has been a major concern in airline industry and in this regard to hedge their exposure of fluctuation the industry of airlines have shifted to call and

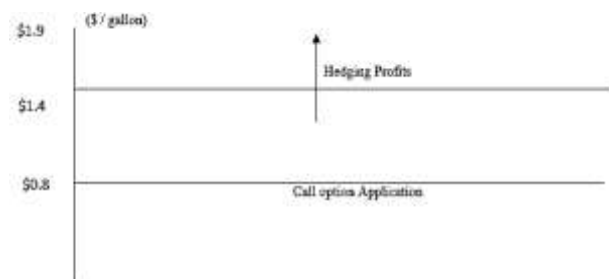


Figure 7: Using call option saving \$1.20 per gallon of gas

put option called a collar. Strike price (exercising [rice of contract) and price rising higher, call options protects its holder from it. Regarding the risk of possibility of decrease in price of its strike price the holder of call option also limits any possible gain by keeping a put option. The put option premium received and option premium paid difference is the cost total of taking two options. Price fixation of fuel between two values identified is basic reason of popularity of above in airline industry[15]. The below figure 8 shows to protect \$1.20 per gallon of fuel a collar option is used which is suggested by

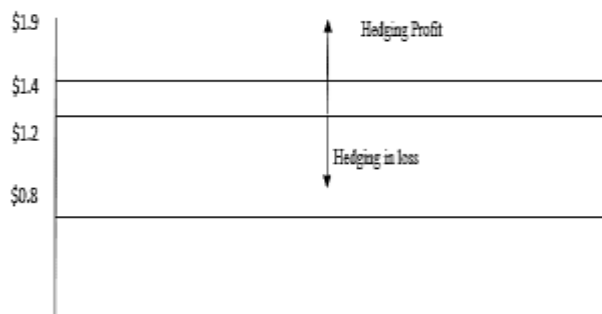


Figure 8: Collar option to protect \$1.20 per gallon of fuel

In the airline industry there are various hedging strategies and one of the most favourite of all as stated by gives the swap. To use the swap option especially in the airline industry, at a fixed price for a period of one year the airline would acquire a swap per month for a particular amount of jet fuel. Comparison in between the strike price and usual price is determined. The major difference in between the usual price and strike price times the amount of fuel to the airline would be paid by the counter party if the usual price is larger than the strike price.

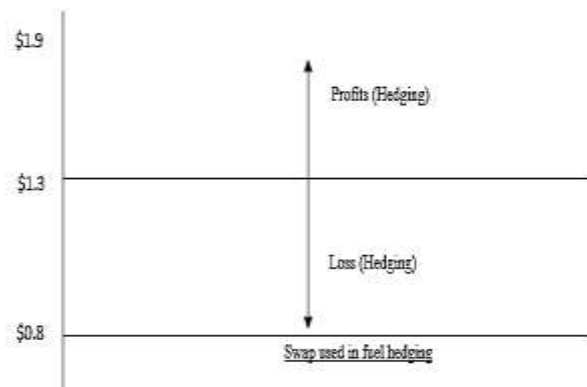


Figure 9: Save \$1.20 per gallon of fuel by using the swap

Responsibility would be of the airline for paying the difference if the average price is lower than strike price. To protect 1.20 dollar per gallon of fuel using the swap below mentioned figure 9 is suggested . Many studies and investigations are done in this regard, a third study was carried by and Gerner. Ronn and Gerner study was backed by observation and conclusions drawn from swas that to provide insurance against abrupt higher price fluctuations the airline company used call option. Upward and downward jet fuel prices have been a major problem and to counteract, hedge their exposure to fluctuation airlines allow buying a jet fuel swap. The increase on the fuel swap

counteracts increase in cost of fuel when there is increase in fuel price. The other side of it is if there is declination in the fuel prices the fuel swap counteracts the loss that is reduction in the fuel cost execution of swap once, either way, fuel cost has been locked by the airline. The consistency of the first three arguments articles mentioned above has been maintained and, in this regard, according to Director of Corporate Finance for Southwest Airlines, Scott Topping, "To hedge their fuel cost the majority of airline depend on instrument of plain vanilla including collars, call options and swaps. Many articles have been published and one of those articles by Cobbs and Wolf indicated that "the one of the most common used hedging contracts by airlines are call options (involving caps), collars (involving premium collars and zero cost), plain vanilla, basic swaps and differential)". Another statement regarding this was stated by Lim and Hong that some airlines are using futures, but today the majority of airlines uses call options and swap to hedge price risk in the jet fuel. This argument was supported by Westbrook's and according to his statement in order to control fuel risk most airlines use hedges. This is achieved by mostly using call options, collar options and swaps.

Fuel hedging performance investigation was studied and conducted in 2002 by Simkins, Roger and Carter of 27 firms in the industry of U.S airlines for a period of 1994 to 2001. It has been found and established that in hedging tools using swap and call options show positive relation which in turn results in capital investment value increase. During the investigations it has come to notice that a positive relationship in between using capital value and hedging tools rises up. Thus, from this it can be concluded keeping both quantitative as well as qualitative criteria of this research the best practice are swaps, call option and collar options. The reason to this is that these are primary derivatives that are used in the industry of airline showing the positive relation.

C. Hedging Decision Responsibility

Many factors form basis for responsibility of making hedging decisions such as involvement in hedging by a company and size of it. The survey which was conducted by the Mercatus participants constituting 22 percent of the survey described responsibility of making hedging decision is by the board of director. Participants constituting 39 percent of organization have a committee known as committee of special hedging. Participants constituting 11 percent made responsible for making hedging decisions to CEO (Or President) on the other hand finance responsibility of decisions were handed over to CFO OR VP by 22 percent of organization. Responsibility for making the hedging decisions were not revealed by 6 percent of organization. Hedging decision responsibility according to this research is shown by Mercatus and is shown below in the figure 10.

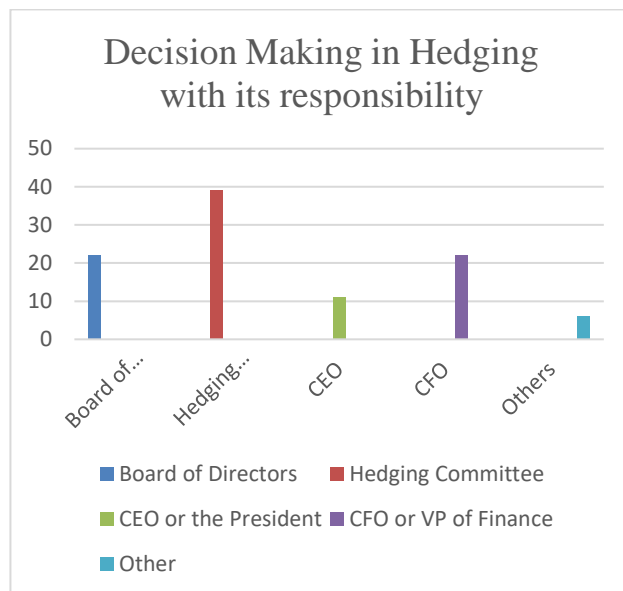


Figure 10: Decision making in hedging with its responsibility

Airline companies depend on fuel suppliers and financial institution for making right hedging decision, data, information and hedging advice is provided by their counter parties. Companies which participated in the study about 68 percent of it were dependent for hedging advice on financial institutions. This figure 11 list includes brokerage and bank firms which have for this personnel expert for hedging. Companies constituting 16% depend on information from suppliers mostly fuel suppliers. Companies constituting 11%, for taking hedging decision hire consultants. Only small portion of 5% depend on internal resource for hedging decision to gather information and data. In order to exemplify it below there is a fig which shows prime source of hedging assistance, information and data for 24 commercial airlines as shown by Mercatus.

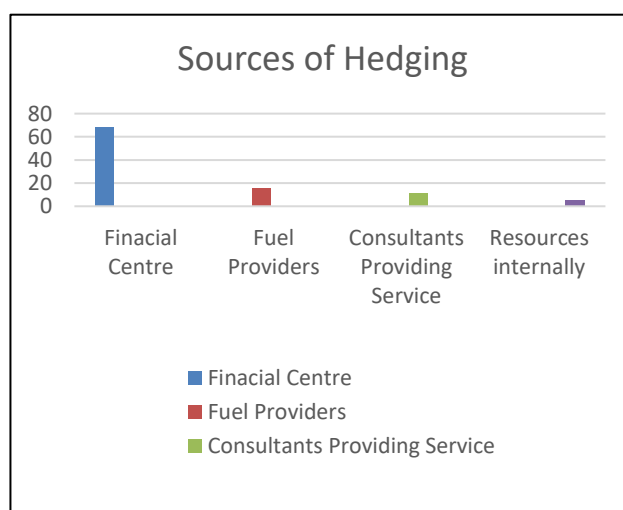


Figure 11: Hedging Sources

One of the primary risks in airline is jet fuel and its other characteristics. This is one which is neither exchanged in any exchange market nor traded, but Over-The-Counter (OTC) it is traded. On both the sides, counter party risk is

involved within OTC trades, this results in difficulty in finding the banks by small airlines that are ready to accept the risk factors in selling derivatives of fuel to them. Direct trade of OTC derivatives is traded between banks and airlines and in this regard to reduce the counter party risk most airlines companies trade usually with multiple banks. For dealing in OTC securities, opening an account in a bank particularly for hedging is the first step. In order to identify the selling price of security the fuel supplier is contacted by the bank. The transfer of necessary funds to the fuel supplier account is done by bank only when Airline Company will accept the price quoted.

IV. CONCLUSION

For applying material hedging this thesis develops step by step guidance and in order to match airline fuel hedging with material construction hedging this thesis can be considered as one the first attempts and in addition to this using hedging weather procedure for construction organization. In order to support its actual implementation in hedging this thesis provides lower level of detail and as far as model is considered, when we compare these two models, we find that model developed by this thesis is approximately same as MacDonald's model. In the development of budget mostly of projects the most important task which is considered is the cost estimation of construction material. Uncertainty factor comes into play for cost estimation because there is fluctuation in material price from time to time. In order to control the volatility of material price and to reduce its risk material hedging is introduced and for construction organization this is a recent concept. Fuel cost hedging has been introduced in the industry of the airline and a detailed investigation is provided by the report. Fuel hedging in airline and its practices are large in number but to find best practice is important which has been covered in this research and in construction industry how these best practices can be applied is identified and discussed in this research. In hedging airline is a vast area and to identify best practice, this research investigated those results which showed consistent values with less error. Both immediate and direct effect by the best hedging practices on the results have been looked in this report. For material hedging application the general framework has been established which is provided by the best practices which have been identified in the hedging of fuel. In the industry of construction, the application of weather hedging to be used on the first place is discussed in this thesis and to investigate it this research went a step further. Result of which was that this thesis provided an out of a box way combined in the industry of construction for fuel hedging practice. In order to develop a model by using hedging application for the construction material combinations of two hedging process were used with this analysis which was weather hedging process used in the industry of construction and fuel hedging practice in the airline. Analysis of both these two processes were used in this thesis. There is a total agreement with MacDonald's model by the developed model in this thesis. Material hedging and its actual implementation is totally supported by providing more details with the help of these thesis. About all of the phases of hedging tools developed in this thesis have been effectively combined with the Macdonald's

model. Feasibility of hedging application is decided by the material hedging cost and its investigation is the future work which can be done in this area. Economical aspect of material hedging can be decided by the organization and to increase its success feasibility of hedging application can be added to phase of tolerance of model presented by this thesis. Hedging contract and its settlement is very important and to find the best way further research can be done with proper investigation. Hedging situation in different scenarios can be used by simulating them. Example of it can be considered that different situation can generate various settlement options like keeping hedge contract till due date and move out at early stage from hedge. The reliability of model which is presented in this thesis can be further checked with the help of further investigation.

REFERENCES

- [1] A Beginner's Guide to Hedging – Investopedia. <https://www.investopedia.com/trading/hedging-beginners-guide/>,2012
- [2] Hedge (finance) – Wikipedia. [https://en.wikipedia.org/wiki/Hedge_\(finance\)](https://en.wikipedia.org/wiki/Hedge_(finance)),2008
- [3] Hedging Strategies Using Futures and Options
- [4] <https://www.montana.edu/ebelasco/agec421/classnotes/strategies>,2016
- [5] Hedging Strategies Using Futures – MGKVP.
- [6] <https://www.mgkvp.ac.in/Uploads/Lectures/47/2603,2014>
- [7] Using Futures for Hedging | AnalystPrep - FRM Part 1 Study. <https://analystprep.com/study-notes/frm/part-1/financial-markets-and-products/hedging-strategies-using-futures/>,2012
- [8] Hedging Long-term Commodity Risk with Dynamic Hedging. https://www.iam.ubc.ca/wp-content/uploads/2018/10/TaoCheng_MSc_Essay-3_2008
- [9] Mc Donalds:Wendys - Grade: A - Dylan Cooley U McDonald's. <https://www.studocu.com/en-us/document/university-ofutah/hedgofundsprivate-eq/mc-donaldswendys-grade-a/5875915> 2012
- [10] Hedging-Mcdonalds.pdf - Case Study Increasing
- [11] <https://www.coursehero.com/file/39714646/Hedging-Mcdonalds> 2013
- [12] Airline Fuel Hedging - Scholarly Commons. <https://commons.erau.edu/cgi/viewcontent.cgi?article=1527&context=jaae> 2009
- [13] Fuel Hedging and Risk Management: Strategies for Airlines. Simo M. Dafir, Vishnu N. Gajjala · 2016
- [14] Fuel Hedging in the Airline Industry: The Case of Southwest David Carter · 2004
- [15] Airline FinancePeter S. Morrell · 2013
- [16] A Study of Airline Jet Fuel HedgingAdam Harkin · 2012
- [17] Foundations of Airline Finance: Methodology and Practice
- [18] Does Fuel Hedging Create Firm Value?: Evidence from Sandra Lechner · 2010.