ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES

STUDY ON THE EFFECTS OF UNPREDICTABLE PRICE FLUCTUATION ON THE CAPACITY OF CONSTRUCTION CONTRACTORS

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Abbreviations

BaTCoDA = Building and Transport Construction Design Authority

GDP = Gross domestic product

MOF = Ministry of Finance

CSA = Central Statistics Agency

SCC = Standard Condition of Contract

ECCA = Ethiopian Construction Contractors Association

NCB= National competitive bidding

ICB= International competitive bidding

PPA= Public Procurement Agency

MoWUD = Ministry of Works and Urban Development

EEPCo = Ethiopian Electric Power Corporation

ABSTRACT

One of the wide ranging problems that the construction industry is facing is the price fluctuation of construction inputs. This major problem is spread all over the country and domestic contractors are critically affected. Moreover the projects' performances are also affected against time, cost and quality.

The research is about investigating the effects of unpredictable price fluctuation on the capacity of domestic contractors from the contractor's perspective. The study concepts were developed through literature survey that enables to find out the variables. Questionnaire based studies and project case studies are used to assess the problem. Recommendations that would reduce adverse effects of price fluctuation are forwarded.

The research result shows that the problem of price fluctuation occurs in an unpredictable manner with increase in price by more than 34%. Contractors lose portion of their expected profit by at least 2.43% of contract amount. To accommodate at least some portion of any future fluctuation contractors introduce some risk factors in their pricing. The price fluctuation system that is in place is limited to few construction inputs. Moreover, contractors get compensation only for portion of the price increase of inputs. Project delay was found to be one of the major effects of price increase and delay caused by the contractors is also affecting the themselves by making them vulnerable to effects of price increase.

Finally, based on the analysis of the results, recommendations for contractors and other stake holders have been proposed that enables to minimize the adverse effect of price fluctuation on contractors and favors the construction industry for better performances.

Key words: *Contractors' capacity, cost estimation, price fluctuation, price fluctuation compensation, pricing*

1. INTRODUCTION

1.1 Research Overview

Ethiopia is still a developing country; and there is a huge development activity yet to be undertaken. One of the key factors to ensure a desired level of economic growth in a developing country like ours is achieving a significant amount of investment by the private as well as the public sector. In this development activity the infrastructure development sector is the one in which the construction industry is a front line role player. However the general state of the domestic construction industry in Ethiopia is reportedly characterized by:

- an inadequate capital base,
- old and limited numbers of equipment,
- low level of equipment availability and utilization
- deficiencies in technical, managerial, financial and entrepreneurial skills, and
- very limited experience or participation in private sector road and bridge works and provision of related consulting services.

The above listed deficiencies have been the subject of many discussions over the last period of time. This research work also focuses on the effects that could result on the capacity of construction contractors as a result of unpredictable price fluctuations.

Construction is an incessant activity across the globe. In most countries, construction activity constitutes 6-9% of the gross domestic product (GDP) and constitutes more than half of the fixed capital formation as infrastructure and public utilities capital works required for economic development [Chitkara 2003]. In

Ethiopia, construction constituted 3.8-5.0% of the GDP between the year 2001 to 2005 [Gebremedihine Birega 2006]. For instance, the Ethiopian Government had allocated an average of 58.2%of its annual capital budget for Public Construction Projects between 1996/97 and 2001/02 [Wubishet Jekale 2004].

In this era of globalization and fierce competition no country can any longer count on its traditional export items. If properly encouraged the "Construction Industry" could serve as a base for development. The construction industry is one of the important economic sectors if not the most important sector of a country.

In some of the developing countries, the growth rate of construction activity is faster than that of population and of GDP [Chitkara 2003]. It contributes to the economic development of a country. The GDP per capita and the investment in the construction per capita generally follow a straight line relationship that is, construction activity increases with the increase in per capita income.

The housing need of Ethiopians in general is miles and miles away from being met. In addition to meeting the housing needs, the construction industry is expected to open-up highways, congested streets, rehabilitate slum areas and widen narrow streets and alleys of cities and towns. Building airports, bus terminals, railways, industrial buildings to house machinery and equipment are some of the tasks of the construction industry. Furthermore, irrigation canals, hydroelectric dams to harness the many rivers to generate electric energy, sports fields and stadiums, recreation centers for the public, swimming pools, grain stores and silos to prevent wastage of grains during and after harvests, market places to distribute products to the consumers are all within the domain of the construction industry [Gebre-Michael Paulos 2002]. To meet this wide infrastructure development need; the existence of a strong and well developed construction industry is of paramount importance.

Construction project owners, whether it is a government body, a public or private agency, an entrepreneur or a builder, undertakes developmental facilities like housing, roads, power plants, water works and others with certain motives or long term aims. For example, the typical motives or the strategic aims of the government in developing infrastructure may include economic growth. A corporate body may aim at making a profit on its investments, providing service facilities to its employees, meeting growth needs of the organization, engaging idle resources, staying in business, earning good will, or rendering social service to the society.

If the construction industry is wanted to develop and play its role of creating the necessary physical infrastructural facilities, creating employment opportunities and in accelerating the economic and social development of the country, consciously planned and determined positive steps must be taken to encourage the development of the construction industry in all its aspects. On one part it is indeed naive to expect that foreign construction know how, foreign construction entrepreneurship and foreign financial resources could solve the chronic development needs of Ethiopians because everything foreign is not affordable. Encouraging private national contractors could certainly enable the country to conserve the foreign exchange earned and borrowed. So the old and traditional household wisdom "a dollar saved is a dollar earned" becomes relevant for Ethiopia at this time.

Consciously and purposefully encouraging the private construction sector could really accelerate development in the country and alleviate the acute infrastructure shortage of the nation [Gebre-Michael Paulos 2002].

This study deals with one of the major problems that hinders the growth of the construction sector in general and construction contractors in particular.

1.2 Focus on the Construction Sector

The fragmentation of the construction industry in Ethiopia primarily undermined the importance of the construction sector for the development of the country. Furthermore infrastructures involving civil works were identified in most sectoral development programs of developing countries. The government policy has clearly showed importance to education, health, hydropower and road development programs through its commitments for a decade. These four sectors represented those sectors whose linkages (sector wide), and for the development initiatives of the country, were very vital.

However, infrastructure projects were dispersed among sectors and viewed as support to them. For instance MoWUD, which was acting as the main umbrella, was dealing only with building construction projects, and this was acknowledged to cover only the lowest category of the Construction Industry. MoE run its construction projects (whose share of the capital budget is about 50%) with a small engineering unit at its lowest management level. Ministry of Health does similarly. Civil works in the water sector largely remained in the Ministry of Water resources. Construction projects related to the communication industry were fragmented among road, airport, railway, and telecommunication sectors. Energy has also exhibited similar approaches. This has devalued and fragmented the real contribution of the sector to the country. As a result, clear GDP or other contributions were not fully accounted for. In addition, the domestic capacity of the construction industry could not be materialized. Furthermore, the total picture of the construction industry and its development could not become visible. These sectors deal their construction projects independently which had resulted in a fragmented and de-capacitated construction industry so far. Above all these, its importance to development was acknowledged through other sectors. This fragmentation did not only make loose sight of integration as a whole, but also the views of each sectors as

a support element undermined the construction industry development [Wubishet Jekale 2004].

So, any intervention applied to enhance the sector's problem, the domestic contractors would eventually become beneficiary, or vice versa. A generalized relationship of actors in the construction industry and the national economy of a country is shown in Figure 1.1.

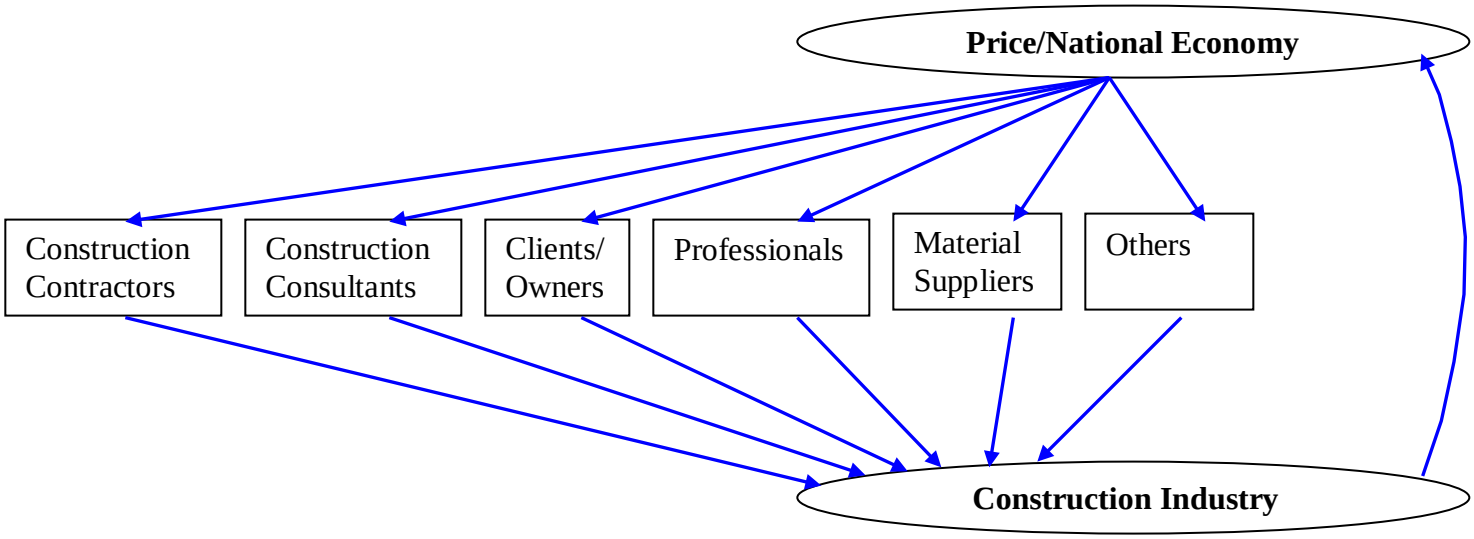

Figure 1.1 Relationship of Actors of the Construction Industry and National Economy

1.3 Research Problem

In developing countries construction projects were often subject to long delays and increased costs. The major factors contributing to this situation are:

- difficulty in obtaining tenders;
- inefficiency in planning, design, and construction;
- difficulty in obtaining vital resources: materials, equipment and skilled personnel - and their high and fluctuating costs;

- poor estimating and financial planning;
- inappropriate tendering and contractual procedures;
- and inefficient on-site construction. [George Ofori 1993].

The construction industry in Ethiopia is challenged by several problems which tend to confront the sector and thus making efforts at developing the construction industry is very difficult and complex. The underlying problems of the construction sector can be classified into two main categories. The first is related to the consequences of the fact that the sector is not viewed and planned in an integrated manner, but rather, operates with fragmented, unrelated and often conflicting components [Wubishet Jekale 2004]. The second problem is related to deficiencies and market price fluctuation of the inputs required for the construction [Gebre-Michael Paulos, 2002].

The deficiencies and market price fluctuation of construction inputs is also greatly hindering the growth of the construction industry. The availability and affordability of building materials in quality, quantity and variety is very important for the development of the construction industry [Gebre-Michael Paulos, 2002]. The unpredictably occurring sharp price increases lead contractors into failure to complete their projects within the acceptable margin of time and quality for the client and fail to complete within the planned cost margin for themselves. This hinders their growth in all aspects.

Construction contractors are the major actors in any construction project for they are the ones who take up all the responsibility to undertake the whole construction activities and related tasks. These major tasks include procurement of materials, deployment of all the necessary machinery, equipment and human resource, managing the financial resources and converting all resources into the intended project outputs. Therefore, among the different stake holders involved in the

construction industry, contractors are the ones at the front line to play the largest role in realizing projects. Hence, on due course of their operation they are the ones to first face the problems and challenges encountered within the industry.

The essential resource ingredients that must be considered in the construction of a project are physical resources (Material and Machinery), manpower, finance and information. This research work focuses on the effect of unpredictable price fluctuation of these physical resources on construction contractors.

1.4 Research Motivation

The motivation for this research was mainly due to the prevailing unpredicted and erratic price fluctuation of materials, labor and equipment and less satisfactory practice of compensation for the same in the construction industry of Ethiopia. This situation makes the construction contractors sustain most of the suffering and losses that could result there in. Accordingly as a result of the resulting losses, the construction contractors face difficulties in building their capacity in any way.

In addition to the prevailing situation, virtually no research work has been conducted in the country, on studying the effect of the unpredicted price fluctuation in relation to construction contractors. The experience and observation of the researcher on the above said practices and the requirement for the partial fulfillment of master's program in Construction Technology and Management ignited the motivation.

1.5 Research Goal

This research is aimed to study how the capacity of construction contractors is affected by unpredictable price fluctuations and seek for possible means of minimizing the resulting adverse effects, particularly on domestic contractors.

1.6 Research Objectives

The objectives of this particular research are believed to lead to the attainment of the research goal, being:

1. To identify the specific characteristics of prices of inputs of construction
2. To identify the pattern of fluctuation of construction inputs prices in the past years
3. To identify the relation between price fluctuation and capacity of construction contractors
4. To assess the effects of price fluctuation on capacity of construction contractors
5. To develop strategies or interventions for minimizing the adverse effects that would result

1.7 Research Questions

This study has thus probed the following queries:

- How is the price of construction inputs behaving?
- How are contractors acting against price fluctuation?
- What does the compensation practice look?
- How the currently prevailing price fluctuation affects the capacity of construction contractors?
- How can the adverse effects of the price fluctuation be minimized?

2. LITERATURE REVIEW

2.1 The Project Concepts

Projects are often implemented as a means of achieving an organization's strategic plan [PMBOK 2004]. Almost all civil engineering constructions are undertaken in project form having a predefined cost, completion time and quality.

2.1.1. The Project Definition

In this research, projects are understood with these three major identifying characteristics [Wubishet Jekale 2004]: projects are unique, projects are temporary and a project is a component of a certain program.

Projects are Unique**:** - The project uniqueness is understood very well in different literatures. PMI, 2000 and PMBOK, 2004 recognized uniqueness of a project as associated with the creation of a new product or service, which has never existed before, in some distinguishable way from all other similar products or services. Others put it differently as a project is a non-routine, non-repetitive, one-off undertaking and involving a constantly new and unknown activities or processes.

Projects are Temporary: - This characteristic is related to the timing of the project, which focus a transient relationship between project and parent organization covering two aspects: limited resources, and the lifetime of the project organization.

Resource and Requirement Constraints: Projects are constrained by resources largely acknowledged as time, cost and quality requirements. Projects have to be ready within a certain completion time. Finance, which is an incomparably scarce resource in Developing Countries as opposed to their counterparts in the developed nations,

creates considerable importance attached to cost constraints when compared to the others two.

Projects are Components of a Certain Program: That is, projects are usually established for achieving a predetermined specific goal. All processes in project management are, therefore; conducted to achieve this goal. The goal of every project may also differ among the parties involved. That is, the goal owned by the project owner is different from the goal owned by the project doer. As our concern is in the construction business, the goal owned by the construction contractor by far differs from the goal owned by the client or the project owner. The goal of the contractor is definitely of making or maximizing profit from that particular project and building its capacity in different aspects. Whereas the goal of the project owner or the client is different from that of the contractor and is dependent of the nature of the project; public construction project, business oriented project or military nature [Wubishet Jekale 2004].

2.1.2. Civil Engineering Projects

Civil engineering projects involve several stages: inception/briefing, designing, tendering, construction and commissioning. In fact, there are detailed activities to be accomplished to progress from one stage to the next. This approach of treating civil engineering projects as linearly progressive is recently facing strong arguments from some professionals. They argue that civil engineering projects should have cycles, rather than progress linearly. The cycle of civil engineering works is similar to the linear approach discussed above except that it includes maintenance after commissioning and the cycle continues.

Whichever approach one follows for civil engineering works, the parties who take part in the whole process are clients, consultants/designers, contractors, public authorities, financers and users. These parties may have direct or indirect

interactions between each other. Their interaction is presented in figure 2.1[Abebe Dinku 2003].

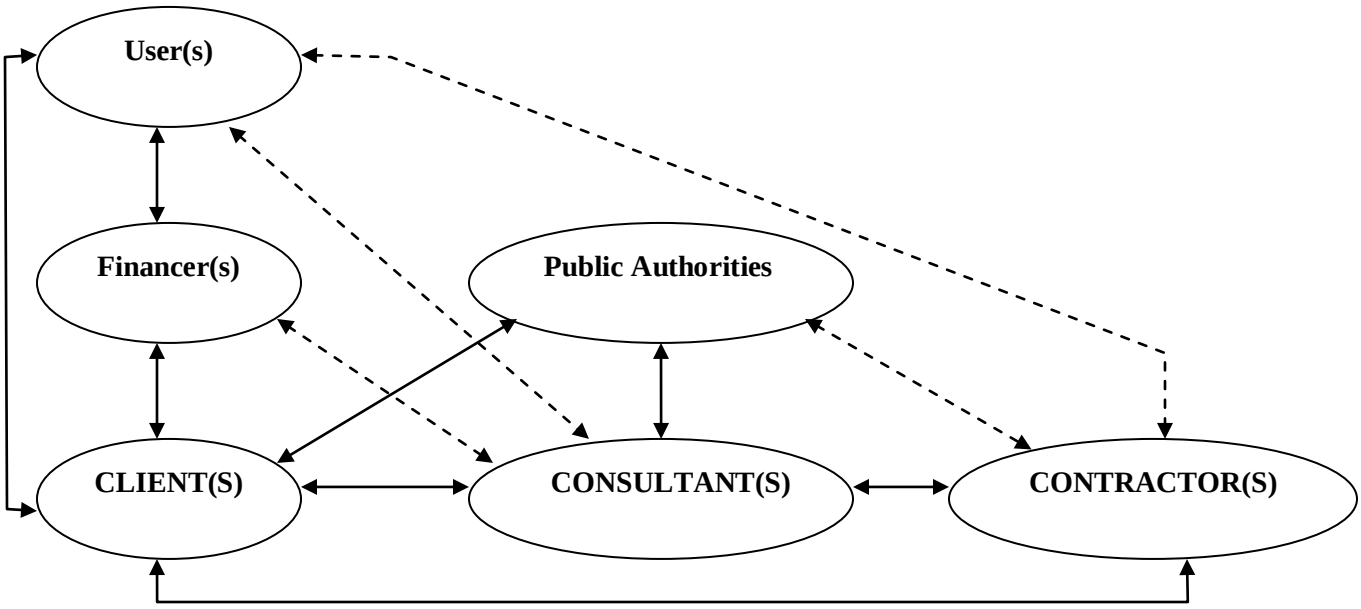

Figure 2.1 Typical interactions between parties in civil engineering projects.

2.2 Price in Relation to Contractors

The construction industry is a business sector which carries out a huge amount of turnover. Among the parties involved in civil engineering works, contractors and consultants are purely of business organizations. The others may or may not be of business organizations. And from the contractors and consultants, it is the contractors that are mainly involved in diversified activities that are directly affected by the prevailing market situation.

With this respect, the overall business environment comes into picture in affecting the contractors in many aspects; performance and capacity being the crucial ones. This research, however, takes only the capacity aspect for consideration.

Market price fluctuations at all levels directly affect contractors, since they are the front line role players in the construction business. Contractors are subject to procure and deliver all the necessary labor, material and equipment, the cases depending on the type of contract, required for the completion of the works. This makes them to directly be linked with suppliers, sub contractors and the labor force.

In principle contractors need not sustain and suffer permanently from price fluctuations on the market. Such fluctuations shall be sustained by the project owners or clients.

2.3 Price Fluctuation

Price fluctuation can generally be defined as the rise or fall of price of goods, materials and services on the markets. Price fluctuation can occur at any market, i.e at international markets, local market and/or at the labor market. The reasons for fluctuation are several, the major ones being [Stukhart 1982]: Government's regulation on oil price, shortage or excess supply at market and increase or decrease in demand of a certain item.

Government's regulation on oil price: the price of oil governs the cost of materials since oil is related to production or transport of materials. When the government changes the price of oil, the price of materials also changes accordingly.

Shortage or excess supply at market: the availability of certain item on market has an inverse relationship with the price of the same on the market. If an item is supplied in excess amount on the market, its price will reduce from its normal price, and inversely, if there is a shortage of the same item, then its price will rise.

Increase or decrease in demand of a certain item: the price of a certain item has a direct relationship with the demand of that particular item. If the demand for certain item rises, then its price will also rise and vise versa.

2.3.1. Inflation and the Construction Industry

The term "inflation" applies to the "disproportionate and relatively sharp and sudden increase in the quantity of money, or credit, or both, relative to goods available for purchase". Inflation produces a general rise in price levels but, more importantly, causes a decrease in the monetary unit with time, and these consequences are proportional to the rate of inflation. If the effects of inflation are not included in financial and economic studies, possible outcomes include selecting incorrect alternatives, understanding budgets, and overstating profits. Although some may consider inflation as neutral factor because both prices and costs rise, we shall demonstrate that it is not.

The growth in total investment costs for the education sector development, road sector development, water sector development and energy sector development reflects the severe effects that economic factors have had on construction . The last few years have seen even greater distortion in the economy and in particular, in the construction industry. Construction owners are aware of the overall rise in construction costs, and the increase in cost of labor and materials is the most obvious manifestation.

Inflation has become a chronic problem whose effects permeate the entire construction industry. Contractors are faced with server uncertainty in bidding and financing work on projects. Owners are not only paying for the increased costs of facilities and capital but also for premiums on construction prices because of the uncertainties of inflation and its side effects. Productivity is affected because contractors can not accurately forecast long-term returns on their investments and

are required to divert necessary capital to meet resource costs. In particular, the proper assignment of economic risks in contracting should reduce costs in the long term, although this would entail considerable change in construction industry operations [Stukhart 1982].

Many articles address how one may gain limited protection from chronic inflation. Most familiar is indexing which is a means of discounting actual birr to "real'' or inflation-adjusted birr. But this adjustment infrequently applied dose not account for other effects, such as individual price distortion or hidden costs resulting from the inability to forecast on one's investment. It is common, even with the national attention on focused on the problem, for members of the construction industry in the Ethiopia to ignore or assume zero inflation perhaps this behavior is due to believing that inflation is a temporary phenomenon and that overcorrecting for inflation may exacerbate the problem [Stukhart 1982] this logic in itself, is even more reason to include the best possible inflation forecasts into all aspects of planning to continue to apply such forecasts consistently, and to revise such forecasts as new data is received.

Changes in relative prices result from inflation as well as other causes, such as government regulation or oil price shocks.

2.3.2. Differential Price Changes

If certain resource costs increase faster than others , the use of constant cash flows leads to erroneous results. First, most such analyses use the consumer price index. The correlation between construction costs and the consumer price index is questionable. Second, even a more representative index would not consider costs that escalate at rates appreciably different from the general inflation rate. This subject has been addressed in several articles concerned with the extreme rise in energy costs [Stukhart 1982].

2.4 Price Fluctuation in Relation to Construction Contractors and Compensation Practices

Construction contracts are subjected to changes in costs. Material costs accounted to about 40 - 70% of the contract price in Ethiopia, and changes in costs of construction materials were considerable. The Standard Condition of Contract of Ethiopia, 1987 used to entertain these provisions following its legitimacy after the Civil Code of 1960. However, these provisions were deferred in 1994. The reasons behind such exclusion were related to the inability of assessing changes in costs due to market dynamics and absence of appropriate information management system to this end. This is a regulation for standard contractual conditions before the MoWUD, 1994 issue. Supplemental arguments were that, this created the administration of such changes non-reliable, sensitive to self-interest serving provisions (in this case corruption in the form of bribing) and above all hindrances to implementation progresses. Besides, international contracts were allowed to such provisions. These changes only affected local contracts. This had its contribution in keeping local contractors underdeveloped with low capacity and could not be competitive. Besides, most contracts will still be reserved for foreign companies. Furthermore, projects slowed down and local contractors' financial sources deteriorated causing the local capacity of the Construction Industry to step down [Wubishet Jekale 2004].

The implication to these was that the government could not tolerate and accept such conditions and decided for fixed cost pricing contracts. Again, if one clearly digs the entire motive of such decision, it is solely based on the accountability issue and only serving the interest of the Government. This is because, the decision could not address the situation in depth specifically, and the level of development of the Construction Industry generally.

Besides, the absence of local construction organizations to administer contracts with regard to claims has contributed to inability by local practitioners to deal with claims forwarded by international contractors. As a result, most claim requests took considerable time. However, capacity building for local construction companies should also be Government interest.

The Construction Industry is not well developed. On the other hand, development demands are tremendous and the majority of works to this industry will still remain to be public projects. Consequently, if project providers in particular and the construction industry in general was supported with appropriate policies, its detrimental effect will either slow down the wish of development demands or give way to foreign companies to fulfill such demands [Wubishet Jekale 2004].

2.5 Effects of Price Fluctuation

Price fluctuation can have effect on contractors, clients/owners and the project itself. The major effects of price fluctuation on contractors, if not well compensated, can be summarized as follows [Stukhart 1982 & Abdo Abatemam 2006]:

- Profit loss of contractors
- Cash flow (project financing) problem of the projects
- Delay in project completion
- Poor quality of project outputs

2.6 Price Estimation Methods and Setting of Prices

2.6.1. Basic components of pricing

Pricing in construction projects is a critical step that has to be undertaken very carefully. It is a process whereby the organization interested in the construction of a project attempts to determine the expenditure of resources such as materials,

manpower, machineries, finance and time necessarily to realize the intended project and also determine the revenue it expects from the execution of the same. Therefore, it can be put as pricing as two major components: the cost component and the profit component.

2.6.2. Cost component

The cost component consists of the direct construction cost, indirect construction cost and risk allowances. Tadesse Yemane, 2006 has categorized the cost components in the following manner:

a) Direct construction costs

The direct costs mainly include material, labor, equipment and subcontract costs as described below.

a) Direct material costs
b) Direct labor costs
c) Direct equipment costs
d) Subcontract costs

Direct construction costs are all costs that can be specifically recorded with an activity in a project. The direct cost cover the largest portion of the total project cost and these costs can be budgeted, monitored and controlled far more effectively than the indirect costs.

b) Indirect costs

Indirect construction costs are all costs, which cannot be directly booked under a specific activity in a construction project but required to keep the whole project operational. These costs are also called overhead costs, which mainly include the head office and site overhead costs as listed below.

1. Head office costs

Head office overhead costs are all costs required to run the whole operation of the construction company, which usually administers different projects at a time. These

include: Senior management costs, indirect labor costs (salaries and benefits of staffs other than the senior management members), head office building costs, bidding expenses, expertise service costs i.e for professional services such as external auditors, lawyers, management consultants and external trainings, office furniture and equipments, office running expenses, workshops, garages and warehouses, bank charges, insurance charges, transportation and travel expenses and sundry (miscellaneous) expenses.

2. Site over head costs

Site overhead costs are all costs required to run the whole operation of a specific construction project at site level. These include: Site management costs, indirect labor costs (salaries and benefits of staffs other than the site management members working at the project site such as site engineers, office engineers, administrative and finance staffs), mobilization and demobilization costs, site offices, office furniture and equipments, office running expenses, radio communications, camp facilities, access roads, water and power supply, workshops, garages and warehouses, bank charges, transportation and travel expenses.

c) Risk allowance

It is very essential to incorporate risk allowance in pricing for construction project pricing. This helps to compensate the negative impacts of different risks such as contractual, technical, political and economic risks.

Contractual risks are usually stemming from the contract agreements with the project owner, subcontractors and suppliers.

Technical risks are associated usually with the clarification of the technical specifications, working drawings, construction technology and difficulties in understanding new method of constructions.

Political and economic risks reflect the impact of political situations, stability of economic policies, inflation and price fluctuation of the inputs (material, labor, equipment and other related costs) on the execution of the intended construction project.

The quality and accuracy of construction cost estimation can be continually improved as the construction execution progresses where more detailed and actual data become available.

2.6.3. Profit component

After carefully estimating the cost of a project, contractors need to decide on the amount of their competitive profit they like to make from the project. The profit margin they set depends on the scale of the project and the level of competition between bidders. Sometimes, large profit margins are adopted in cases of uncertainty. Any business company operating a profitable business in Ethiopia is obliged to pay income tax based on the prevailing income tax law.

2.7 Pricing techniques

As it is possible to construct an image of a prehistoric animal such as the brontosaurus from only a few key bones and relics, so a theory of cost estimating may possibly be found on a few factual details. Factors affecting pricing are [Skitmore 1988]:

- Types of projects
- Sizes of contracts
- Geographical locations
- Numbers of bidders
- Ability of 'pricer'

- Level of information
- State of market

There are different techniques of cost estimation that can lead to the final pricing. The Project Management Body of Knowledge, 2004 puts the different cost estimation methods as follows:

1. Analogous Estimating

   Analogous cost estimating means using the actual previous cost of similar projects as the basis for estimating the cost of the current project. Analogous cost estimating is frequently used to estimate costs when there is a limited amount of detailed information about the project (e.g., in the early phases). Analogous cost estimating uses expert judgment.

   Analogous cost estimating is generally less tedious than other techniques, but it is also generally less accurate. It is most reliable when previous projects are similar in fact, and not just in appearance, and the persons or groups preparing the estimates have the needed expertise.

2. Determine Resource Cost Rates

   The persons determining the rate or the group preparing the estimates must know the unit cost rates, such as staff cost per hour and bulk material cost per cubic meter, for each resource to estimate schedule activity costs. Gathering price quotations is one method of obtaining rates. For products, services, or results to be obtained under contract, standard rates with escalation factors can be included in the contract. Obtaining data from commercial databases and seller published price lists is another source of cost rates. If the actual rates are not known, then the rates themselves will have to be estimated.

3. Bottom-up Estimating

   This technique involves estimating the cost of individual work packages or individual schedule activities with the lowest level of detailed information. This individual costs are then summarized or "rolled up" to higher levels for

reporting and tracking purposes. The cost and accuracy of bottom-up cost estimating is typically motivated by the size and complexity of the individual schedule activity or work package. Generally, activities with similar associated effort increase the accuracy of the schedule activity cost estimates.

4. Parametric estimating

   Parametric estimating is a technique that uses a statistical relationship between historical data and other variables (e.g., square meter in construction, lines of code in software development, required labor hours) to calculate a cost estimate for a schedule activity resource. This technique can produce higher levels of accuracy depending upon the sophistication, as well as the underlying resource quantity and cost data built into the model. A cost-related example, involves multiplying the planned quantity of work to be performed by the historical cost per unit to obtain the estimated cost.

5. Project Management Software

   Project management software, such as cost estimating software applications, computerized spreadsheets, and simulation and statistical tools, are widely used to assist with cost estimating Such tools can simplify the user of some cost estimating techniques and thereby facilitate rapid consideration of various cost estimate alternatives.

6. Vendor Bid Analysis

   Other cost estimating methods include vendor bid analysis and an analysis of what the project should cost. In cases where projects are won under competitive processes, additional cost estimating work can be required of the project team to examine the price of individual deliverables, and derive a cost that supports the final total project cost.

7. Reserve Analysis

   Many cost estimators include, also called contingency allowances, as costs in many schedule activity cost estimates. This has the inherent problem of potentially overstating the cost estimate for the schedule activity. Contingency

reserves are estimated costs to be used at the discretion of the project manager to deal with anticipated, but not certain, events. These are "known unknowns" and are part of the project scope and cost baselines

One option to manage cost contingency reserves is to aggregate each schedule activity's cost contingency reserve that is assigned to a schedule activity. This schedule activity may be a zero duration activity that is placed across the network path for that group of schedule activities, and is used to hold the cost contingency reserve. An example of this solution to managing cost contingency reserves is to assign them at the work package level to a zero duration activity, which spans from the start to the end of the work package subnet work. As the schedule activities progress, the contingency reserve, as measured by resource consumption of the non-zero duration schedule activities are more accurate because they are based on cost estimates that are not pessimistic.

Alternatively, the schedule activity may be a buffer activity in the critical chain method, and is internationally placed directly at the end of the network path for that group of schedule activities. As the schedule activities progress, the contingency reserve, as measured by resource consumption of the non-buffer schedule activities are more accurate because they are based on cost estimates that are not pessimistic.

2.8 Risk in Pricing

The role and contribution of the Construction Industry are pivotal and the primary conduits for infrastructure development and maintenance. In construction industries and the various project stages, one of the silent day to day realities are risks and uncertainties. And construction industry is inherently risky and uncertain and these arise from the nature of the industry itself. These are faced due to evolving and emerging conditions through project lifecycles and project environmental

circumstances. They are generally due to physical, economic, social and political circumstances *inter alia* with resources available and the project characteristics at hand [J E Okema 2000].

Construction is a risky business. In construction projects, risk exists in all phases of the project development cycle. It is important, therefore, to identify, quantify, and manage the risk associated with the time, cost, quality, and safety aspects during the execution of these projects. In this section, however, the focus is on construction cost, from the contractor's perspective. In general, uncertainties that may exist throughout the project development. Uncertainties that impact project cost could be grouped into two categories: a project-specific and a general-market category.

Escalation, for example, belongs to the second category. Escalation accounts for unforeseen increases in material, labor, and equipment costs. It is important to account for escalation when project completion time exceeds a year. Escalation is generally tied to inflation, and it is advisable to have an escalation clause in construction contracts. Escalation should not be included in a project contingency. Project specific uncertainties give rise to risk that should be accounted for in the project contingency. This includes:

- the project delivery system, i.e., the project ownership, the construction management approach used (traditional, phased, or fast-track construction), and the type of contract;
- project state of technology, which includes the process, material, and equipment;
- project location;
- project complexity;
- logistics, access to the project site and site characteristics;
- project definition stage, generally the more information the less uncertainty and lower the inaccuracy in estimating the project cost;

- quality of design;
- project schedule—generally the tighter the schedule becomes, the higher the risk of experiencing a cost overrun. It should be noted that time is money, and a tight schedule may deprive the contractor of the opportunity to optimize the project cost; may lead to loss in productivity due to site crowding or congestion, interference or staking of trades; and may result in accidents; and
- project procurement plans and policies.

In addition to the sources of risk stated above, there are a number of other sources that could be grouped in a third category of unpredictable risks. This includes acts of God or force majeure, fire, natural disasters, strikes, and human error. None of these, no matter how significant they may be or how much they may affect the cost, should be included in a project contingency.

2.9 Principles of management of risk and uncertainty

There is no clear cut, definition of risk and uncertainty. Many scholars look at it from different perspectives. However, it is generally agreed that, in risk and uncertainty, the outcome or activities are likely to depart from expectations. It is considered that, the effect of the deviation from expectation could be Value-Neutral, Value-Negative or Value-Positive. In construction project management, these values are in the form of Time, Quality and Economy of the project. Therefore, in construction project management, it is the effect of risks and uncertainties on project time, quality and economy that is the subject of management and management development.

In dealing with risks and uncertainties management as challenges facing construction industry in developing countries project management, the focus should be on:

- Identification of the various risks and uncertainties that the project faces.
- Categorization and Quantification of risks and uncertainties that the project faces.
- Risk and uncertainty sensitivity analysis for the project.
- Project risks and uncertainties allocation and distributions to those with better capacity and mechanism to handle each categorization. This may include the traditional allocation to God/gods through prayers or by ignoring the risks and uncertainties. Sometimes, some people handle it in superstitious manners either through fortune-tellers or witchdoctors or traditions for example sacrifices of some kind for certain type of projects. Risks and uncertainties allocation and distribution should be done through terms and conditions of contracts.
- Project risks and uncertainties response and mitigation by the responsible people or parties to whom they were allocated and distributed. So that when the threats occur partially or wholly, the project implementation is protected from their consequences or compensated for the consequences.

The fundamental bottom line of principles of management is that risks and uncertainties are not entirely negative but also holds significant opportunities that their proper management could be very much rewarding. It is this double edge notion of risks and uncertainties that is the benefit of the management challenge in Construction Industry. This is also the only managerial attitude that makes the management approach comprehensive, relevant and optimal. [J E Okema 2000]

2.10 Types of Construction Contracts

Construction contract types have direct impact on the cost estimation of construction projects. Similarly, the contract type of a project also has a direct impact on the compensation in case of price fluctuation. There are many types of construction

contracts, which are applicable based on the prevailing specific project conditions and largely the interest of the owner, as listed below [Tadesse Yemane 2006]:

- Lump sum fixed price contract
- Lump sum fixed price and escalation contract
- Lump sum fixed price and schedule rate contract
- Lump sum fixed price with escalation and schedule rate contract
- Unit rate contract
- Unit rate and escalation contract
- Schedule rate contract
- Schedule rate and escalation contract
- Cost plus percentage of cost contract
- Cost plus fixed fee contract
- Cost plus percentage of cost with guaranteed maximum cost contract
- Cost plus fixed fee with guaranteed maximum cost contract
- Target cost incentive contract

2.11 Capacity of Contractors

Generally contractors' capacity is differentiated by grades and categories of different levels. These grades and categories are set by the recognized public authorities. Capacity of a particular construction contractor of certain class is characterized by the existence or ownership of two broad properties. These are: ownership of adequate asset and existence of proficient management and professionals.

Ownership of adequate asset: can be expressed as whether that a particular contractor of certain category and grade owns machinery, equipment and liquid asset/cash that the grade requires, in good condition to be effectively utilized for the works that contractor is engaged to carry out.

Existence of proficient management and professionals: in addition to the physical strength that the contractor is required be equipped with, it must also be equipped with proficient management and professionals that the grade, more importantly, the work requires.

2.12 Minimizing the Adverse Effects of Price Fluctuation

Even though price fluctuation cannot be accurately predicted, its impact can be minimized. One way of minimizing the effect is through risk management as discussed in section 2.8 and 2.9. In addition to risk management literatures suggest the following methods [Stukhart 1982]:

- Improved financial utilization of contractors
- Improved contract procedures

2.12.1. Improved financial utilization of contractors

The contractor must identify and purchase items likely to delay the schedule or be in short supply. In addition to this, proper planning and constant review of cash flows provides the best defense against surprises. Companies should also constantly evaluate their profitability against objectives.

2.12.2. Improved contract procedures

The following are improvements on contract procedures are also believed to reduce the impact of price fluctuation on construction contractors, especially the increase in prices [Stukhart 1982]:

- Contract award time

Reduce unnecessary administrative restrictions on contract award and change order procedures.

- Maintaining current information

Update control information continually with current prices, indices, and trends.

- Design time

Expedite engineering/design activities to shorten overall project time.

- Subdivide contracts

By subdividing a large risky venture into several smaller ones at prices more manageable and foreseeable, the total risk will be reduced.

- Payment

Contractors can suffer severely under inflation and high interest rates if payments are delayed. Therefore payments to be made to contractors must not take long time.

- Innovative contracting

Use contracting procedures that shorten the overall design–award–construction time. Such procedures might be starting work with partial designs and using prequalified contractors on a cost reimbursement basis while firm quantities and prices are negotiated later.

3. RESEARCH METHODOLOGY

Generally, this research is done to be an important stepping stone for examining the various aspects of the problem under consideration; understanding and formulating guiding principles to govern the research procedure; and developing and/or testing theories for the enhancement of the existing situation, state or process.

3.1 Research Type

The research tries to explore how domestic contractors' capacity is affected due to unpredictable price fluctuation, and it implements more of descriptive, exploratory and qualitative analysis with little quantitative approach.

3.2 The Study Approach

This study had from the beginning chosen the contractors' perspective as the target to this study. In fact, this can contribute a lot for the overall development of the construction sector and the country's economy as well.

The approach that was adopted to conduct the research process was a desk study or secondary research through surveys using both structured and non-structured questionnaire having descriptive outputs.

3.3 The Research Base

The research bases on problem investigation and contributes knowledge mainly for contractors and for other stakeholders in the construction industry. The research uses concepts as a base line, and then identifying indicators which can be converted into variables [Kanjit Kumar 1996].

Table 3.1 shows the concepts, indicators and the variables used as base for the research.

Table 3.1 Concepts, indicators, and variables assessed in the research

Concepts	Indicators	Variables
Price fluctuation	• Increase in price • Decrease in price	• Market price fluctuation trend/pattern
Price estimation and setting of prices	• Data collection • Data proccesing • Pricing techniques	• Price data collection methods • Pricing methods • Methods to accommodate price fluctuation
Effects of price fluctuation	• Profit losses on contractors • Delay • Poor quality works • Cash flow problems	• Contractors' action during price fluctuation • Opinion on what is happening to contractors • Impact on projects • Impact on contractors
Price fluctuation compensation	• Contract type • Amount of compensation requested • Amount of compensation paid • Amount of compensation denied	• Amount of compensation requested • Amount of compensation paid • Amount of compensation denied • Opinion on the existing compensation system
Minimizing the adverse effect of price fluctuation	• Improvement in compensation system • Improvement in planning and financial utilisation	• Opinion on clause 70 • Opinion on clause 47.1 • What contractors should do • What consultants should do • What clients should do • What regulatory bodies should do

3.4 The Research Scope and Limitations

As it is explained in the previous section, the target population of this research are the domestic construction contractors. Although price fluctuation happens all the

time, its relation and effect in relation to the construction industry, particularly to construction contractors, is not well studied. This has created a great deal of shortage of reference materials for the researcher to build his knowledge. To this end, it was decided to make this research a stepping stone for further similar researches.

3.5 Design of Research Instruments

The research instrument used in this research is semi-structured questionnaire. The questionnaire was designed in such a way that it has three parts. The first part deals with the market price fluctuation and pricing issues. The second part deals with compensation related issues and the third part capacity related issues. In addition to the questionnaire survey two project case studies are included to back the questionnaire survey.

A total of 46 questionnaires are distributed for 46 domestic construction contractors. Distribution of questionnaires to contractors is done at their head offices to make the data collection at company level. These questionnaire were filled by general managers, deputy managers, engineering department heads, office engineers and contract administrators in different companies.

The result obtained in the detailed study of the project case studies is analyzed in comparison to that of the questionnaire survey and the findings are summarized as conclusions of the study.

3.6 Research population and sampling

Unpredictable price fluctuation is a problem of all contractors of different class and category. But since they undertake projects of huge budget, the higher class

contactors are more vulnerable for the adverse effect. Therefore, as mentioned on the research proposal, the study populations included for this research work are domestic contractors of class 3 and above.

Based on this, 46 questionnaires were distributed for:

- 17 grade one general contractors (GC-1)
- 15 grade one building contractors (BC-1)
- 1 grade one road contractor (RC-1)
- 1 grade two general contractor (GC-2)
- 1 grade two building contractor (BC-2)
- 1 grade three general contractor (GC-3)
- 9 grade three building contractors (BC-3)
- 1 grade three road contractor (RC-3)

Similarly, the two project case studies are selected in a manner each project is selected from major civil engineering construction sectors, i.e one from building construction project and the other from road construction. In addition, contractors undertaking these projects are randomly selected from those who are included in the sample for the questionnaire survey.

3.7 The research process

The research problem, initiated from experience and observation in the construction industry have passed through different processes. The research basic information is assessed in the literature review part of the research. The literature review has helped in the assessment and identification of variables. Once the variables are identified, research instrument preparation, and data collection were executed in their order. Consequently, analysis of the data obtained from questionnaires and interviews have processed which involves simple statistical approach, examining, tabulating and categorizing based on the chosen measurement scale. After the

collected data is analyzed, the findings and results are discussed. Finally, the researcher has given his conclusion and recommendation, based on the analysis and discussion.

3.8 Writing the research

This research has three major component stages. These are:

- the research proposal
- conducting and processing of the research
- final writing of the research

The research was started by collecting, compiling and writing conceptual matters from literatures. And the research instrument development was done parallel to the conceptual review and writing. Writing the conceptual part and the data analysis and discussion part of the research had taken the longest period of the research time. The detailed discussion and analysis of the responses from the surveyed research population is presented in this part of the research. Writing of each stage has been done in parallel with the on-going process. The final part, conclusion and recommendation with rewriting of the research was done at last.

The whole research document is classified into five (5) major parts:

I. Introduction (Research overview)
II. Literature review
III. Research methodology
IV. Analysis and discussion with case studies
V. Conclusions and Recommendations

4. ANALYSIS AND DISCUSSION

4.1 General

In recent years, the price fluctuation of construction inputs in the country has become severe and unpredictable. Most construction contractors, especially domestic contractors, face strong challenge during offering their price due to the high uncertainty of predicting what would happen in the course of the project execution. The challenge is even more severe not only as a result of the dynamically escalating market price but also as a result of the poor compensation system and practice in the event of price fluctuation. Based on the aforesaid crude fact, the research problem has been assessed in this research by collecting data with the help of the chosen research instrument; questionnaires, distributed to domestic construction contractors.

The research analysis and discussion is done based on the responses from the distributed questionnaires. The response rate was 60.87% which can indicate a good confidence limit.

Table 4.1 Summary of questionnaire distribution and response rate

S/N	Respondent	Distributed	Responded	Response Rate (%)
1	Construction contractors	46	28	60.87
	TOTAL	**46**	**28**	**60.87**

4.2 Method of Data Analysis

The statistical method used in this research is simple statistics by taking a portion of the target of interest to give response regarding the subject [Dowdy et. al 2004]. And the research data analysis is done by adopting simple statistical approaches. The

research uses nominal measurement scales to analyze the different variables of the research.

4.3 Time Value of Money

The conditions of contracts under which construction contracts are administered do not take the time value of money into consideration. All contract conditions which are under application take the actual amount of cost increased or decreased for price fluctuation compensation purposes. They do not consider the value of money changed due to time, inflation and market interest rate changes.

Therefore, in this research, the actual amount of money spent and the price change in actual money is considered. In other words, the time value of money is not considered in this research case studies.

4.4 Assessment on the General Market Price Fluctuation and Pricing

The first step in this research was to assess the nature and occurrence pattern of price fluctuation of construction inputs in relation to construction activities, in the past three years, from 1997 to 1999 Ethiopian Calendar. In this part of the research, the price fluctuation of construction inputs like materials, labor and equipment was studied.

4.4.1. Domestic contractors and the market price fluctuation

In the recent years in Ethiopia, as a result of the successive economic growth, the price of materials on market is observed to be very unstable. Price of everything has greatly increased and is being increased. The construction sector is one of the victims of this high price rise of inputs. And the main actors of construction are contractors

who are sustaining the damage at the front line. From all contractors, it's the domestic contractors who are most affected. This is because of two reasons: one is the poor compensation they receive in such situations and the other is because of their relatively lower technical capacity to deal with such situations. These will be discussed in the upcoming section 4.5.

4.4.1.1. Market price fluctuation trend

From the response of the contractors who responded to the questionnaire survey, it can be seen that the degree of predictability of material price fluctuation is very low. In other words, the material price fluctuation is unpredictable that contractors cannot easily determine how the price of materials can go on. And regarding labor and equipments, it can be seen that the price fluctuation of these inputs can be fairly predictable, that is contractors can fairly determine how the price of these inputs will go on based on other factors. Figure 4.1 represents the findings from the survey.

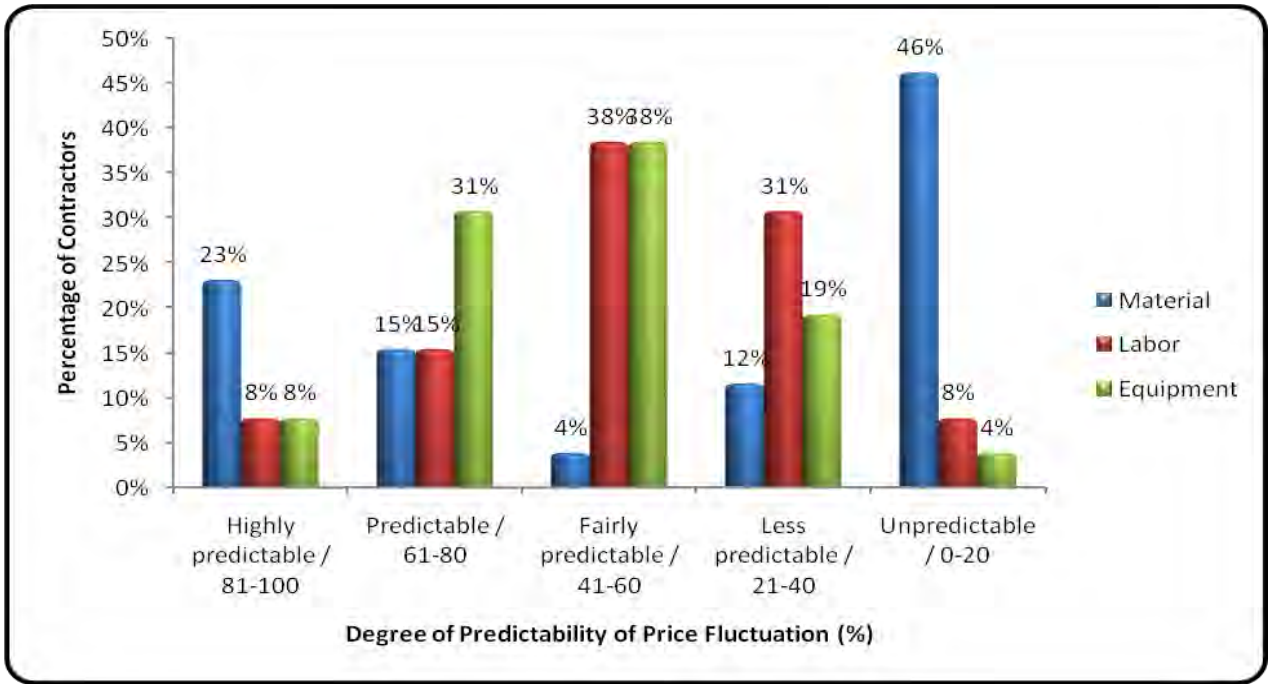

Figure 4.1 Nature and occurrence of price fluctuation of construction inputs

In any case, it can be seen that the occurrence of price fluctuation on construction inputs especially on construction materials is unpredictable and is generally difficult to determine.

4.4.1.2. Major construction inputs whose prices fluctuate

The inputs required to undertake a certain construction project can be divided into four major categories:

a) Material
b) Labor
c) Equipment
d) Technical (overheads)

And these categories can be further divided into sub categories and then to single items. Figure 4.2 represents the summary of the responses of the surveyed contractors on how the price of construction inputs behaved during the research time.

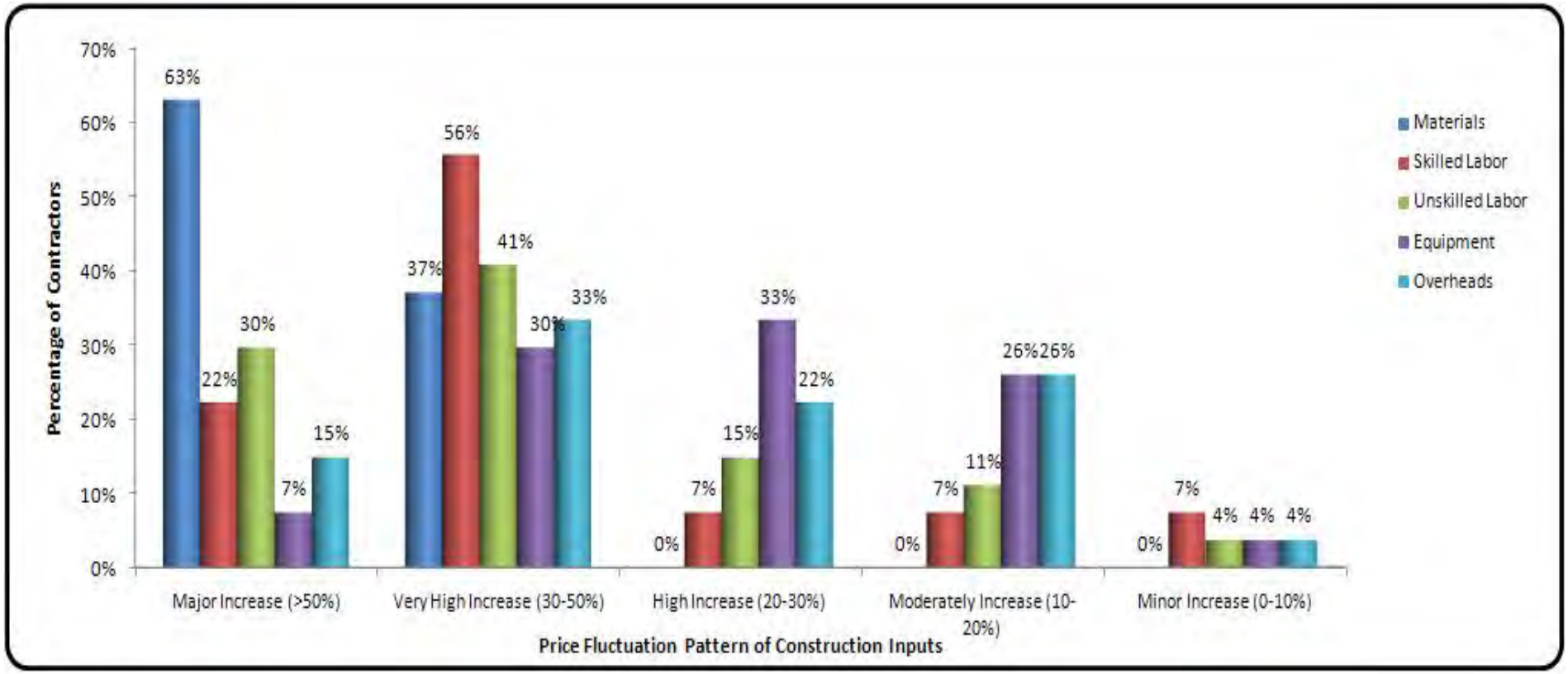

Figure 4.2 Price fluctuation pattern of construction inputs

The questionnaire was developed in such a manner to let the respondents give their response in same manner as described above by listing the items that showed price fluctuation. And the respondents have listed the major materials that showed price fluctuation. In addition, the respondents also rated the price fluctuation pattern of the listed inputs. To this end 63% of the respondent agreed that the price fluctuation pattern of construction materials shows a major increase, which means the price of materials is increasing by more than 50%.

4.4.2. Market survey and pricing

As construction is a risky business, contractors should take a good care while giving their offer. The offer preparation, usually known as the bid pricing [MoWUD SCC December 1994] requires detailed market survey of the construction inputs. The techniques used for the pricing also differ. The pricing does not only require the study of the market, but also requires the consideration of other factors that affect the price like risks of price fluctuation and contingencies. This part of the research deals with how domestic construction contractors prepare their offer and give their prices. Also it deals with how they deal with risks of price fluctuation.

4.4.2.1. Data sources for pricing

The first step in pricing is to collect reliable market data from market and other data sources. Similarly the surveyed contractors have also agreed that they conduct price data collection to be used for pricing. To this end, from the survey, it can be seen that all the surveyed contractors conduct simple market survey to collect price data for the inputs of the particular project they are giving their price. Figure 4.3 represents the summary of price data collection methods adopted by contractors.

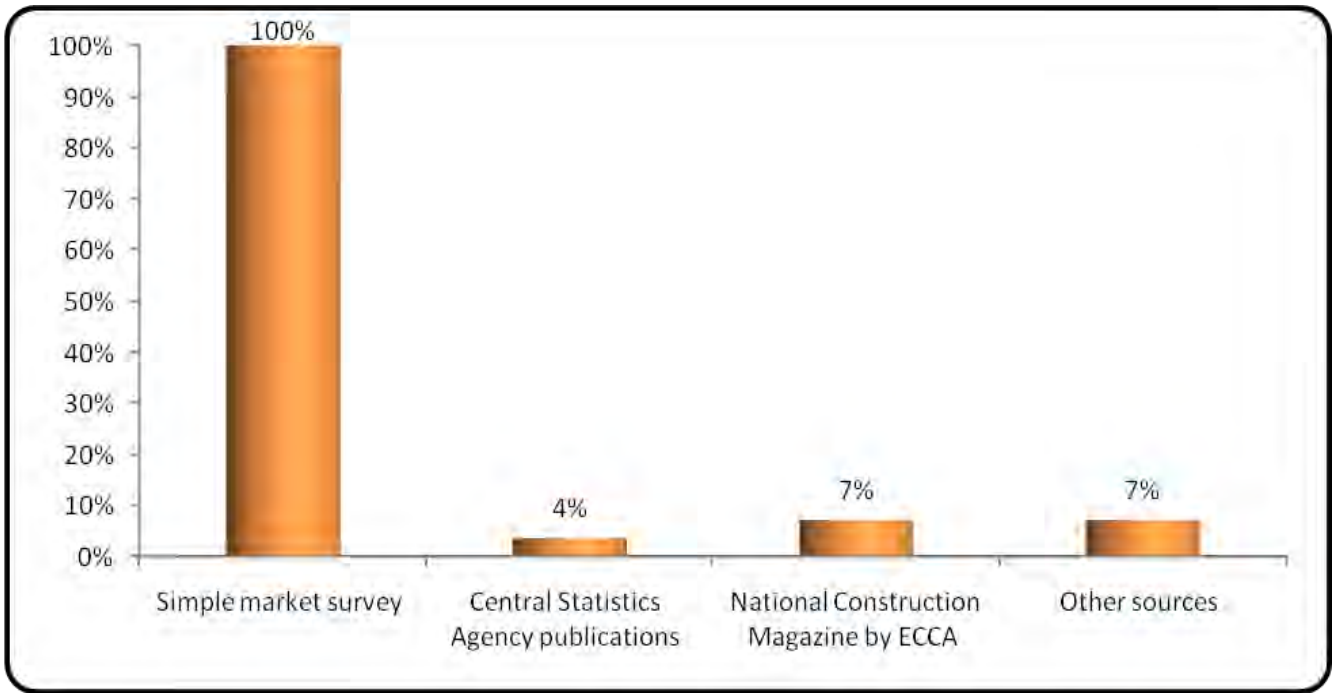

Figure 4.3 Market price data collection methods adopted by contractors

From the above chart, it can be learnt that data sources like CSA publications and ECCA magazine are not widely used by most contractors. The reason was, as described by some of the respondents, the price data published in these publications cannot be reliable because of the dynamically changing market. The price of materials on the market changes within very short time while these publications publish the price data in a very wide time range. Therefore, contractors are forced to conduct simple market survey whenever they are supposed to do price or prepare offer.

4.4.2.2. Pricing methods

The next step after price data collection is pricing. Pricing is a process whereby an organization interested in the construction of a project attempts to determine the expenditure of resources such as materials, manpower, machineries, finance and time necessarily to realize the intended project [Tadesse Yemane, 2006]. As

described in section 2.7 of this work, there are different methods that can be used for pricing. The major ones are: analogous estimation, parametric estimation, bottom-up estimation and computerized tools. In addition, the contract types also govern the pricing in relation to price fluctuation. For contracts which allow compensation for escalation and for those which do not, contractors give different prices or offers. Accordingly, the surveyed contractors were asked what methods they use to convert the raw market price into offer price. In addition, they were asked whether they predict price fluctuation and what methods they adopt to accommodate price fluctuation. Figure 4.4 represents the summary of responses on pricing methods adopted by contractors.

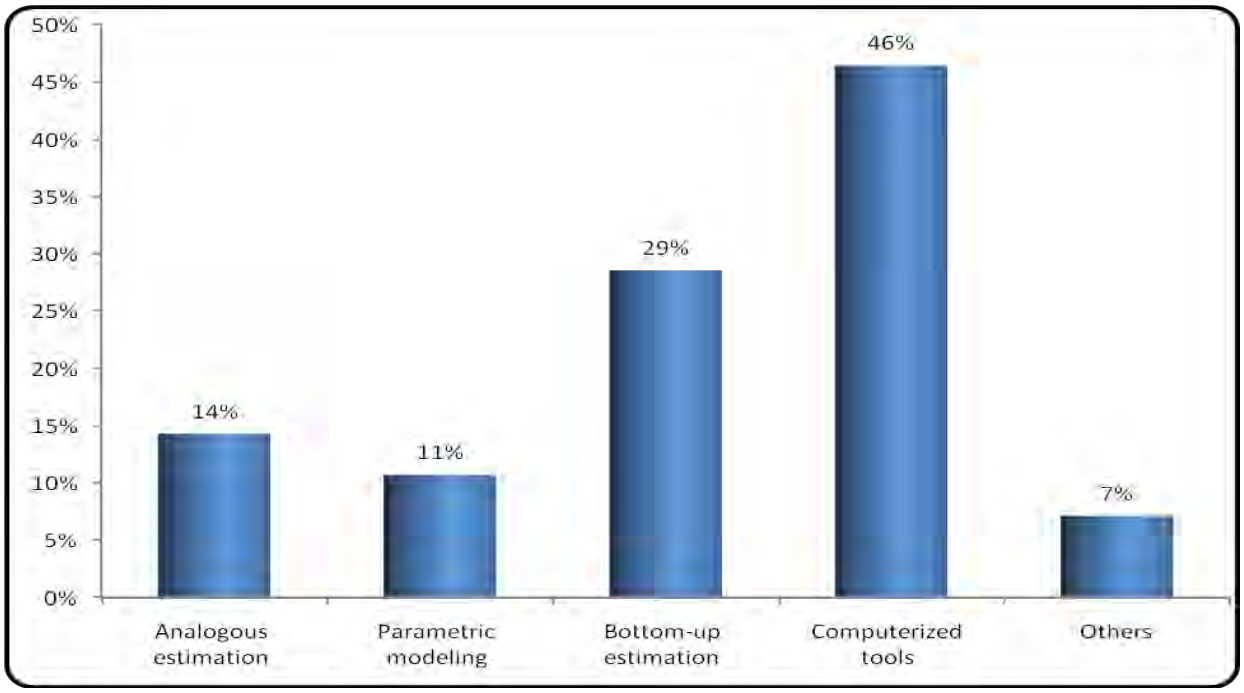

Figure 4.4 Pricing methods adopted by contractors

It can be seen that the majority of the respondents use computerized tools for pricing. In fact, it should be known that the computer based tools that the contractors use are not well developed computer programs. Rather, the tools are developed on spread sheet based program, Microsoft Excel. And these computer

based tools are developed mainly to ease the calculation of cost breakdown of work items. Here it can be seen that the degree of how detail that particular work item is broken down depends on the estimator. Therefore, even though same computer based tool can be used, the inputs to the adopted tool make quite remarkable difference on the outputs of the price estimation or pricing process.

Even though it has been briefly discussed about the methods of pricing, the major concern is how domestic contractors handle pricing during price fluctuation situations or in situations where there is a possibility of occurrence of unstable market. To this end the respondents were asked whether they try to anticipate or predict price fluctuation of any kind to use it as one input in pricing. Accordingly, 82% of the respondents have said they predict the possible fluctuation that would occur and use it as an input for pricing. Figure 4.5 represents the summary of the responses showing the proportion of the surveyed contractors who predict price fluctuation during prince and who do not.

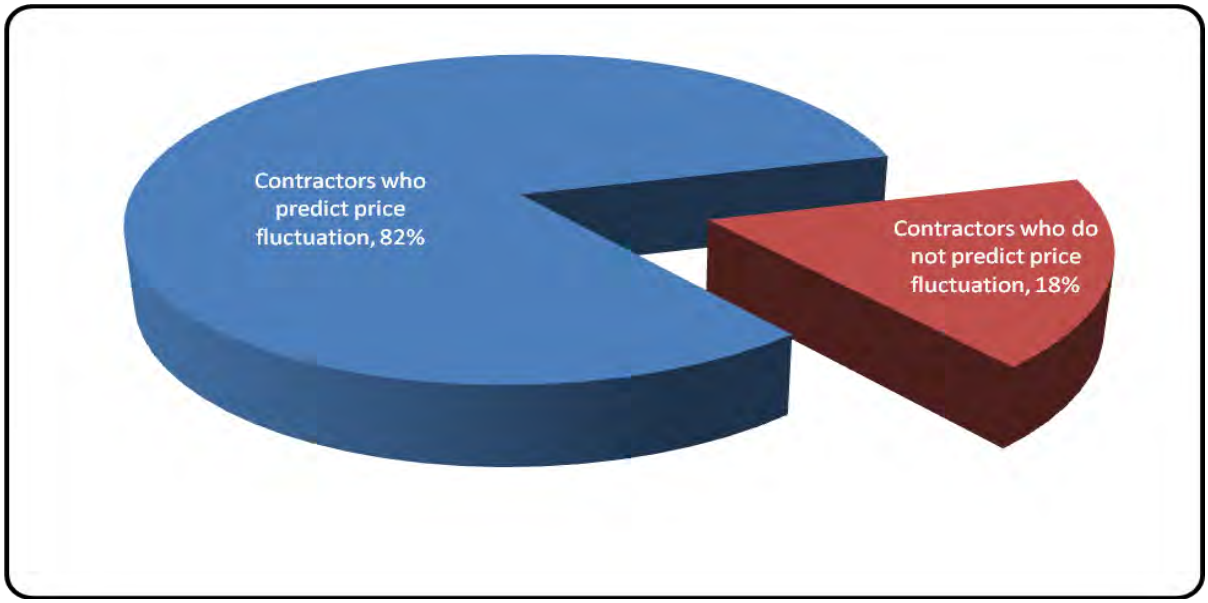

Figure 4.5 Contractors who predict price fluctuation and who do not

Here also another question arises, which asks: "How contractors who tried to anticipate the price fluctuation handle the anticipated price fluctuation during pricing?" To this end the respondents were asked and their response is presented in Figure 4.6. from the surveyed contractors, it was found that 57% of the them convert the result of their prediction into percentage risk factor which is then applied on top of the result of their pricing. Here they adopt a simple process that they study the trend of the fluctuation, if any, and use their own subjective decision to reach to the risk factor to be applied. This risk factor is meant to accommodate any possible price fluctuation, after the work is started, without affecting the planned project budget and profit margin. In fact, this risk factor is not such a huge percentage which exaggerates the overall price.

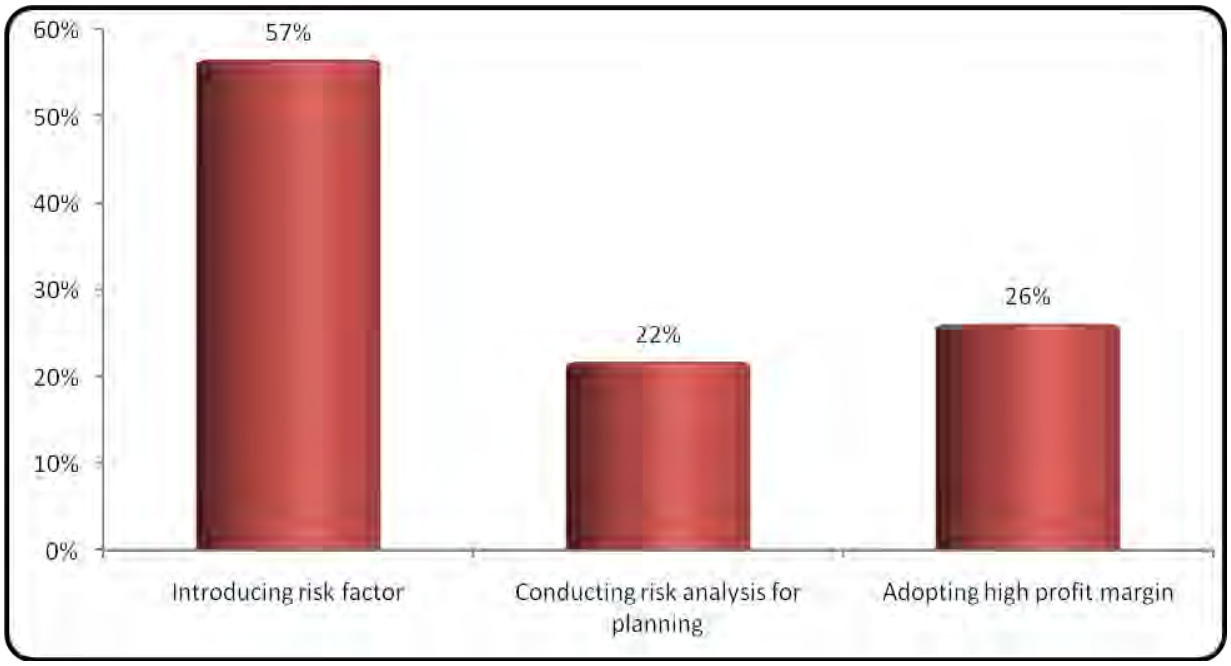

Figure 4.6 Methods adopted by contractors to accommodate anticipated price fluctuation

Other 26% of the respondents said rather than introducing risk factors to their pricing, they adopt high profit margins. And the rest 22% said that they conduct risk

analysis to reach to a decision on how to handle the pricing, where they anticipate price fluctuation.

It can be learnt from all the respondents that, no matter what methods they use during pricing, the ultimate goal of all is to find ways to minimize the effects of price fluctuation which is feared to occur and yet difficult to enumerate. In other words, contractors use different ways of predicting price fluctuation and pricing because of the fact that they anticipate price would fluctuate but they are not quite sure with the magnitude of its occurrence.

The other group of the respondents, 18% of the respondents [Fig 4.5] who said they do not try to predict price fluctuation have given their argument, in one voice, why they do not try to predict price fluctuation. They said, in the first place predicting price fluctuation is difficult. And if they try to predict the possible fluctuation any way, and do their pricing using the predicted increased price, they said they will be out of competition.

Here, one critical lesson can be drawn from both groups of respondents, that is: both witnessed that they anticipate the occurrence of price fluctuation but it is difficult to determine or enumerate. And this makes the price fluctuation that occurs on the course of the project works to be unpredictable.

And the case being so, then how are the other actors of construction projects: clients and consultants, handling unpredictable price fluctuation situations. Also how are construction contractors being compensated in such situations. The findings and analysis on these issues are presented in the following sections.

4.5 Assessment of the compensation system and its effect

In Ethiopia, local construction projects undertaken by domestic contractors are generally governed by the Standard Conditions of Contract by MoWUD. In addition to this, the Public Procurement Agency of the Ministry of Finance has established a new Standard Bidding Document for the Procurement of Works issued in January 2006. And both of these conditions of contracts contain provisions that clearly give way to compensate price fluctuations that occur on due course of construction projects.

4.5.1. The compensation system/practice

4.5.1.1. Provisions in SCC

The Ethiopian Standard Conditions of Contract, versions up to December 1994, has a special category of conditions which says "CHANGES IN COST AND LEGISLATION" and described in Clause 70. In this provision, in sub clause 70.b: it says: "*if the said rates of wages and other emoluments and expenses are increased or decreased by any* ***Act, Statute, Decree, Regulation and the like*** *after the said date of bid pricing, then the net amount of the increased or decreased of the emoluments and expenses shall after due consultation with the Employer and the contractor, be determined by the Engineer and shall form an addition or deduction as the case may be to or from the Contract Price and be paid to or allowed by the Contractor accordingly.*" Here it should be noted that for any compensation to be made, the change in cost of inputs must be changed by legislative bodies. On the other hand, the Ethiopian economy is led by free market economic policy in which market prices are not centrally governed. Market prices are mostly governed by the direct costs, demand and supply relation.

The recently established standard conditions of contract for construction projects by Public Procurement Agency, provides another clause for price adjustment. In sub-

clause 47.1 of this document, it says: "**Prices shall be adjusted for fluctuations in the cost of inputs only if provided for in the Special Conditions of Contract**. Here it can be seen that the provision is open to entertain cost changes regardless of the absence of any Act, Statute Decree, Regulation or the like. In addition, unlike the SCC of MoWUD, this standard bidding document of PPA allows to adjust the bid prices of work items which encountered price fluctuations.

4.5.1.2. The prevailing practice

In all domestic civil engineering construction projects, the MoWUD SCC December 1994 has been the most dominating general condition. In line with this the compensation system was also based on Clause 70 of this SCC, unless the contract is 'firm price' contract. However, as the market price is not centrally governed by any legislative body, it has been very difficult to determine how and how much the price of inputs has fluctuated.

In 1996 E.C, the Ministry of Infrastructure has circulated a directive letter to clients and consultants on which construction inputs to be compensated for price fluctuation. Accordingly, cement, reinforcement bars, fuel and asphalt/bitumen were the only construction inputs that were allowed to be compensated. And the reason for this limited items was that the price of these materials can be easily determined. Fuel and asphalt price is governed by the Ethiopian government, cement price can be obtained from the sole government owned Muger Cement Enterprise, and steel products price can be obtained from government owned steel factories. Here it can be seen that all the materials allowed for compensation are those related to the Ethiopian government one way or the other.

The method of calculation for compensation is also worth discussing. In calculating the amount of compensation to be paid to contractors during price increase or the amount from contractors during price decrease, the prices at two critical times are

the leading variables i.e the price of the inputs during bid pricing and the current price. But one very crucial thing to consider is also the source of these materials. As it is said earlier, the market is not governed by central legislative bodies, except for fuel, and the current market price is not considered for compensation. Rather the government factory prices of inputs are taken for price fluctuation compensation, which are far different from the market.

4.5.2. Contractors' experience with compensation

As contractors are continually acting in the construction industry, they also pass through a lot of experience related to price fluctuation. The surveyed contractors were asked about what they do when they face price increase whether the price increase has occurred on the allowed items or not. And the response was that most of them claim to be compensated. And they also absorb the increased price within their profit margin. Figure 4.7 shows the summary of contractors' responses.

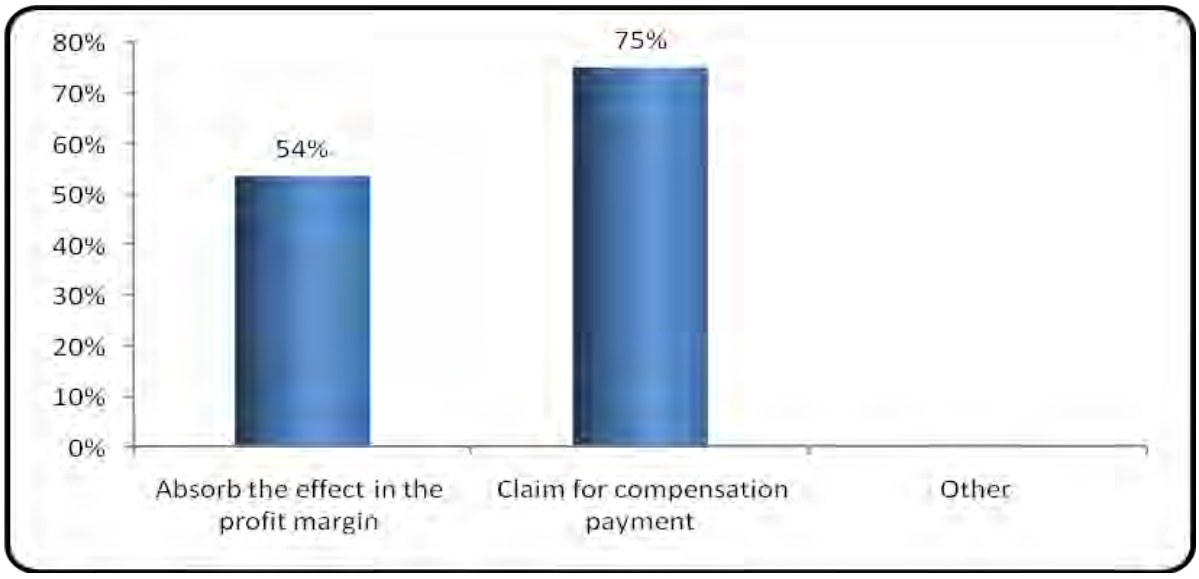

Figure 4.7 Actions contractors take during price fluctuation

Even though they claim for compensation payment, the whole requested compensation was not paid to them for many reasons which will be discussed later.

Figure 4.8 shows the summary of contractors who were compensated or not for some construction inputs whose prices have fluctuated.

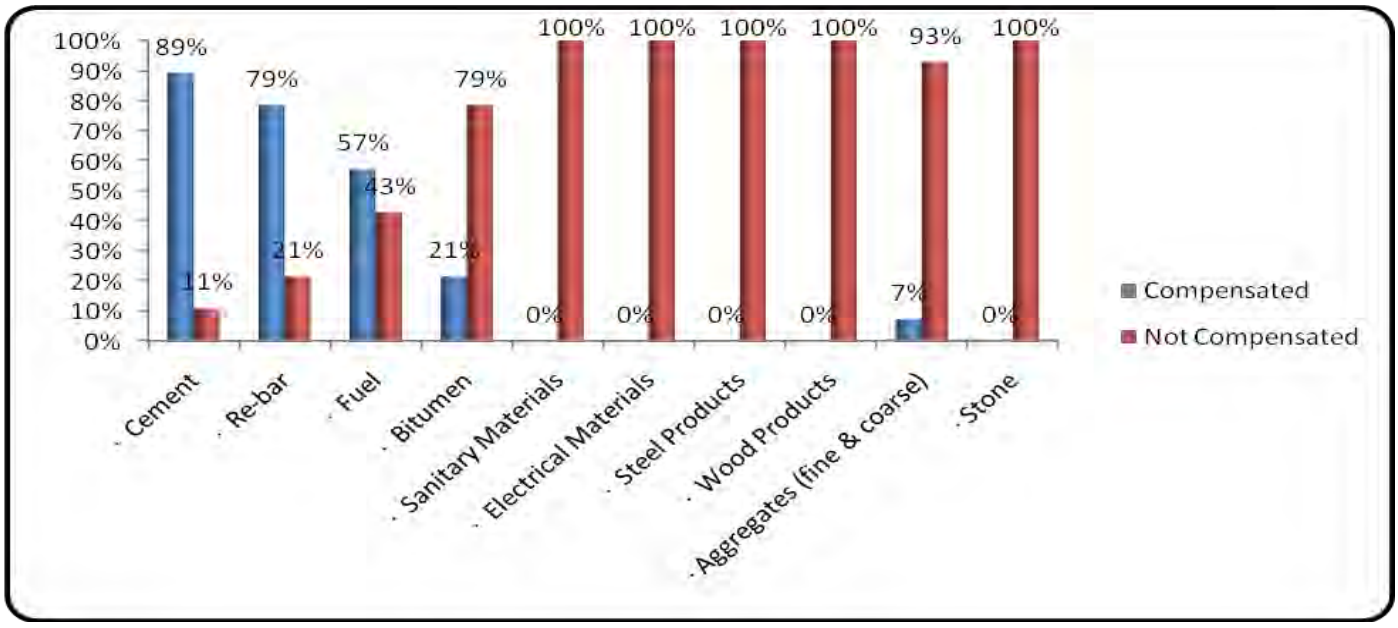

Figure 4.8 Summary of contractors who were compensated and not compensated

The detail experience of the contractors who are surveyed in this study in relation to the compensation is discussed as follows:

4.5.2.1. Requested compensation

Among the surveyed contractors, only 50% of them were able to give data on how much compensation payment they requested. To this end, the total compensation payment requested by these contractors in the last three years was above 100,557,000.00 ETB. This includes their request for compensation of materials, labor, equipment and overheads.

Table 4.2 Summary of price fluctuation compensation payment request

Year E.C	Price escalation compensation payment requested for (x1000 Birr)				Total amount requested (x1000 Birr)
	Materials	Labor	Equipment	Overheads	
1999	52,273.00	1,020.00	3,742.00	5.00	57,040.00
1998	22,966.00	387.00	1,851.00	5.00	25,209.00
1997	16,724.00	25.00	1,554.00	5.00	18,308.00
Total	**91,963.00**	**1,432.00**	**7,147.00**	**15.00**	**100,557.00**

It can be seen that contractors have requested compensation of price increases even for inputs that are not allowed for compensation i.e labor, equipment, some materials and overheads.

4.5.2.2. Received compensation

Out of the requested compensation in the preceding section, it was found out that 81,290,000.00 ETB , which is 80.84%, was paid to the claimant contractors. The summary of amount and percentage of compensation payment paid to the surveyed contractors is presented in Tables 4.3 and 4.4 respectively.

Table 4.3 Summary of price fluctuation compensation payment paid

Year E.C	Price escalation compensation payment paid (x1000 Birr)				Total amount paid (x1000 Birr)
	Materials	Labor	Equipment	Overheads	Total
1999	43,794.00	0	0	0	43,794.00
1998	21,651.00	0	0	0	21,651.00
1997	15,845.00	0	0	0	15,845.00
Total	**81,290.00**	**0**	**0**	**0**	**81,290.00**

Table 4.4 Summary of percentage compensation payment paid

Year E.C	Percentage of price escalation compensation payment paid				Cumulative percentage
	Materials	Labor	Equipment	Overheads	Total
1999	83.78%	0%	0%	0%	76.78%
1998	94.27%	0%	0%	0%	85.89%
1997	94.74%	0%	0%	0%	86.55%
Total	**80.84%**	**0%**	**0%**	**0%**	**80.84%**

4.5.2.3. Denied compensation

The surveyed contractors have shown that the difference between the requested and the paid amounts was because of the reason that consultants and/or clients did not accept contractors' justification for compensation. The other reasons were lack of clear method of tracking, market price is not accepted for compensation calculation as described in section 4.4.1.2 and that contractors have requested compensation for items which are not allowed for compensation as described in section 4.4.1.2. And the result was that contractors were forced to bear the price increases occurred on these inputs. Figure 4.9 illustrates the summary of the responses.

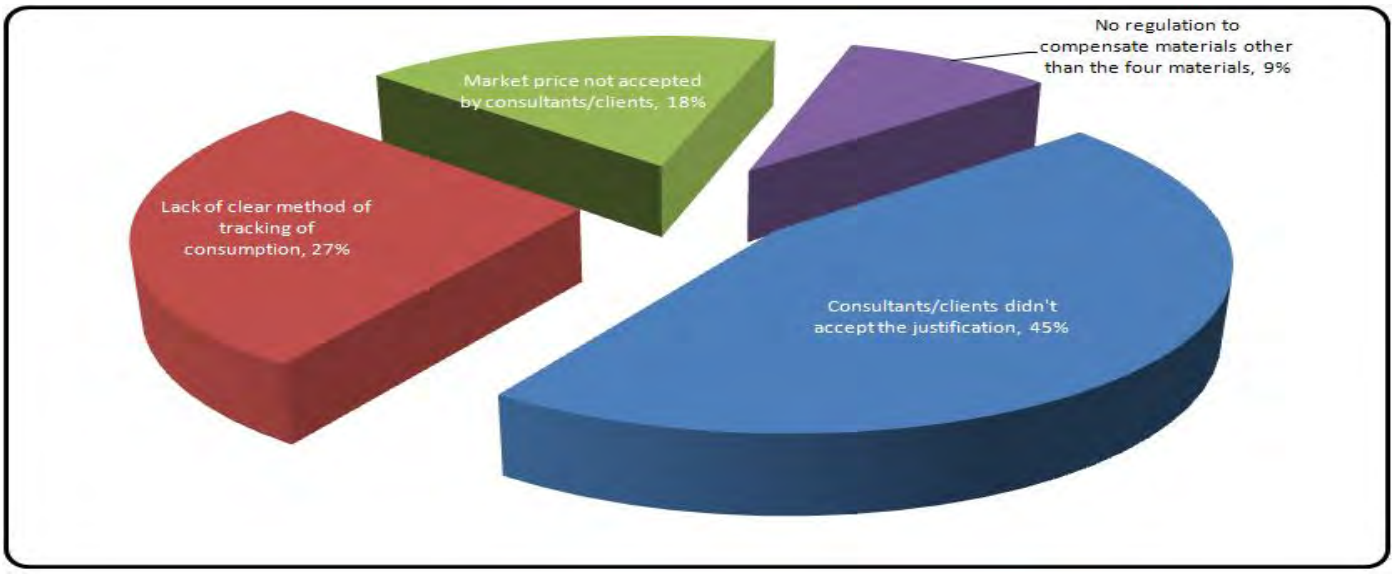

Figure 4.9 Reasons why contractors couldn't get full compensation for price fluctuation

4.5.2.4. Gain or loss due to price fluctuation

Among the 28 respondents, only 9 of them could give response regarding their gain or loss due to price fluctuation. Most of the respondents couldn't give satisfactory response regarding their losses or gains due to price fluctuation, and their reason was they do not have proper records. Although the result cannot be representative it was analyzed and it was found that no one contractor has benefited from decrease of prices. Rather they have been losing considerable amount as a result of increase in

prices on due course of projects. Moreover, the loss that the contractors sustain has been increasing from year to year.

Table 4.5 illustrates the losses that the responded contractors sustained in the past three years. It can be seen that contractors have been losing up to 3.85% of the project amount just due to price fluctuation that could not be determined prior to the bid pricing. The practice of the contractors shows they take 15-20% profit margin in. This percentage might seem to be small when compared to the contractors customary profit margin. But as it can be seen from the result, the profit loss is growing from year to year, which might lead to higher profit losses.

Table 4.5 Financial loss sustained by contractors (non-representative)

Year (EC)	Total project cost (x1000 Birr)	Financial loss due to price increase (x1000 Birr)				Total loss	Percentage
		Materials	Labor	Equipment	Overheads		
1999	328,870.00	9,680.00	2,045.00	505.00	435.00	12,665.00	3.85%
1998	168,323.00	1,950.00	465.00	70.00	97.00	2,582.00	1.53%
1997	187,012.00	2,557.00	3,980.00	2,425.00	1,347.00	1,347.00	0.72%
Total	**684,205.00**	**24,187.00**	**6,490.00**	**3,000.00**	**1,879.00**	**16,594.00**	**2.43%**

4.5.3. The effect of the unpredictable price fluctuation

So far it has been discussed what the current price fluctuation compensation provisions are there in the contract documents of domestic projects, what the practice/system is there and what the experience of the domestic contractors in relation to price fluctuation compensation is. In line with this, it is worth to see what effect does unpredictable price fluctuations have on the contractors and the projects as well. Accordingly, the surveyed contractors have indicated that the price fluctuations that occur unpredictably have impact both on the capacity of the

contractors to undertake their projects and on the overall performance of the project itself.

To this end, 54% of the surveyed contractors have shown that such price fluctuations result in delay of the projects. Here it can be seen that price fluctuation is also on cause of delays in projects, which is one of the major problems in our country's civil engineering construction projects. Price escalation has been ranked the 6th major cause of delay in civil engineering construction projects [Abdo Abatemam 2006]. Figure 4.10 represents the summary of the responses on the impacts of price fluctuation on projects' performance .

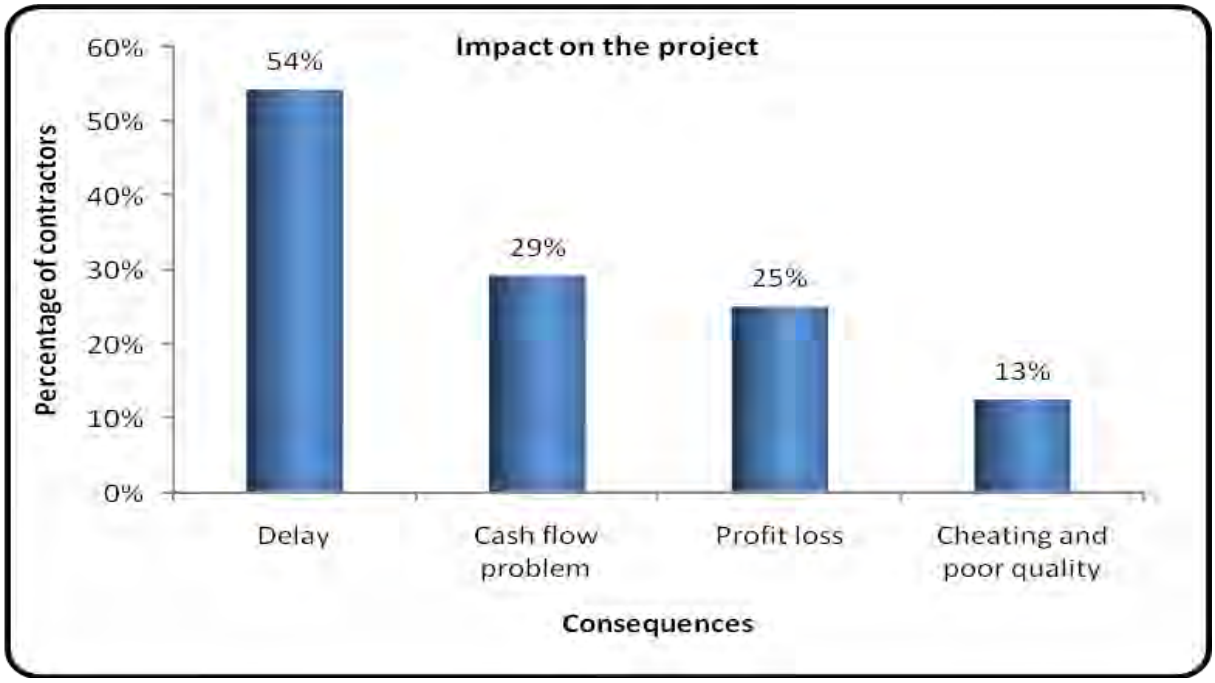

Figure 4.10 Impact of price fluctuation on project performance

In addition to the delay, it was also found out that cash flow problem of contractors, profit loss and poor quality output may result as a result of unpredicted price fluctuation. Therefore, it can been that price fluctuations can result in poor project

performance by delaying project time, by increasing the project cost and by making contractors to deliver poor quality projects.

On the other hand, the surveyed contractors also indicated that unpredictable price fluctuations also greatly affect their capacity to complete the projects and it endangers even their capacity to stay in the industry. Contractors who are forced to suffer the negative consequences of unpredictable price fluctuation also face profit losses and cash flow problems. This finding can be related to the cause of slow growth of domestic construction contractors. Figure 4.11 represents the summary of the responses on the impact of price fluctuation on contractors.

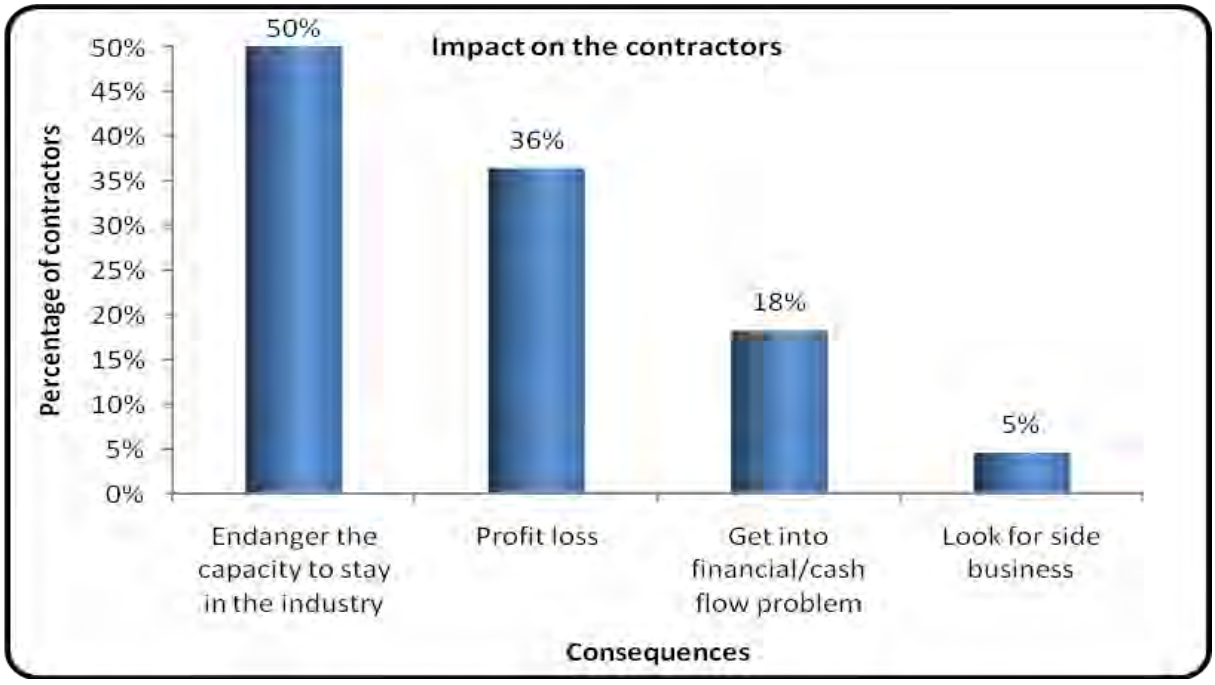

Figure 4.11 Impact of price fluctuation on construction contractors

The profit losses, time delay and financial problems on due course of project can force contractors to shift to other businesses. In light of this fact, 5% of the surveyed contractors have said they have other side businesses, like construction materials production or importation, to build their financial strength. The above findings

show that most construction contractors do not seem to operate with full confidence of sustaining in the industry.

The surveyed contractors were also asked about the year they last upgraded their capacity in any form: by adding machineries, expanding staff, upgrading grade and category etc. accordingly it was found that 64% of the surveyed contractors upgraded their capacity before four years. The reason they gave was that the recently happening price fluctuation could allow them to expand their capacity.

4.5.4. Reflection on the compensation provisions in SCC

The price change provisions in the pertaining standard contract conditions have been discussed in section 4.4.1.1. In this section, the opinions of the respondent contractors on these provisions will be discussed. The first step to assess through this issue was to see how the surveyed contractors feel about the application of the Clause 70 of the MoWUD SCC, December 1994 version. To this end, 68% of the respondents agreed that it is not well applied. The following figure 4.12 represents the summary of the responses.

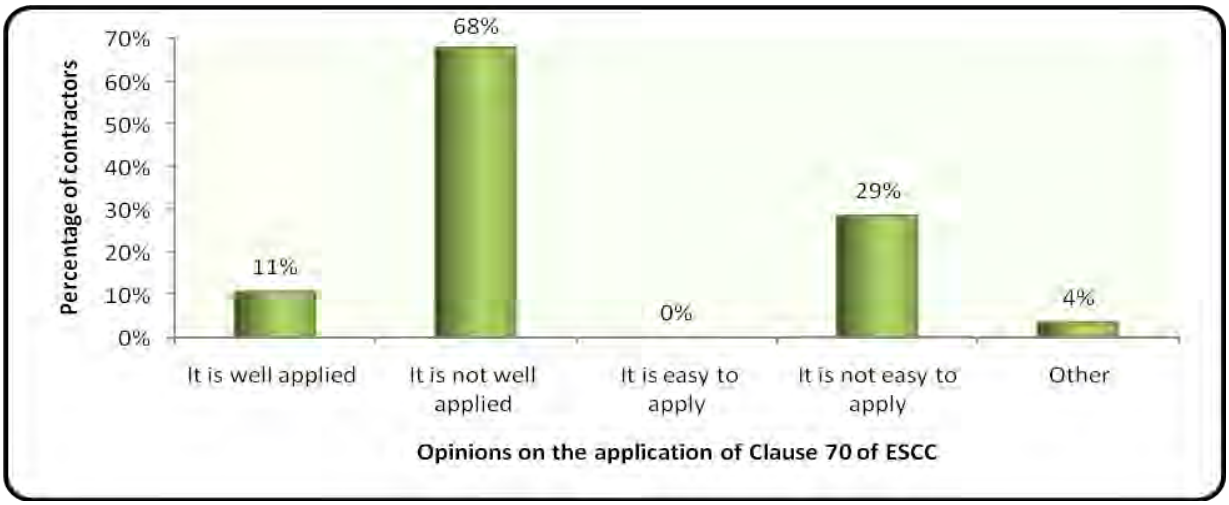

Figure 4.12 Contractors' opinion on the application of Clause 70 of SCC

The reason was that, there are only four construction materials allowed to be considered in cases of price fluctuation while there are many construction inputs whose prices can fluctuate unpredictably. Also, the nature of the market in some particular country together with the economic policy directly governs whether prices of inputs are controlled centrally or not. In a country where free market led economy is established, it may be difficult to control and regulate prices of inputs centrally. Rather the demand and supply relation strongly governs the prices of materials, especially the price fluctuation.

Therefore, since the Ethiopian economic policy is free market economic policy, the prices of inputs cannot be easily controlled centrally. And since the application of the clause under consideration requires action from legislative bodies it becomes difficult to apply it.

It can also be seen that it may be for same reason that the Ethiopian government has limited the inputs that are allowed for compensation. Those materials whose prices can be easily set by government factories like for cement and steel; and those whose prices are set by government agencies like fuel and asphalt.

Here, it is not only these four materials that their prices can be obtained from government factories, there are many different materials like electrical materials, sanitary materials, paint and many others. But all are not subject to price fluctuation compensation except the four. And material is not the only input in construction. Labor has a considerable share in the cost of a construction project. Literatures show that labor consists 17-21% of the cost in building projects and 7-10% in road projects. But the clause under consideration completely ignores fluctuation in the labor market. Therefore, generally the Ethiopian SCC Clause 70 was said to be not well applied as it should to be.

On the other hand, regarding the newly established price adjustment provision of PPA, some of the respondents witnessed that they are not well familiar with it but have positive expectations. Among the surveyed contracts, 50% have agreed that the pertaining Clause 70 of MoWUD SCC should not be avoided, rather it should be amended to encompass wide range of inputs to be considered for compensation in cases of unpredicted price fluctuations. Figure 4.13 represents the summary of the responses.

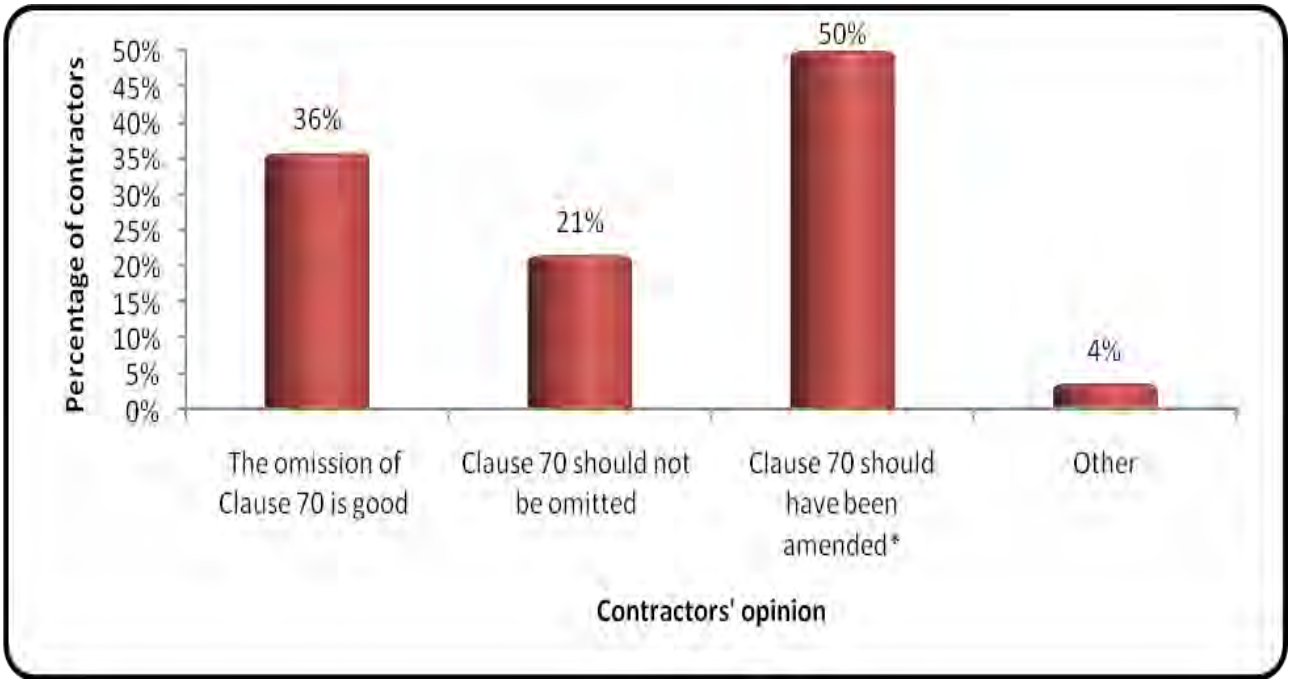

Figure 4.13 Contractors' opinion on the replacement of Clause 70 of SCC

Others, 36% of them, have said the new method is good because it doesn't exclude inputs from being considered for compensation in cases of unpredicted price fluctuation. Moreover, it does not need the market prices to be changed by Act or Decree or Regulation or the like.

Even though most of the surveyed contractors opted for the improvement on the pertaining SCC of MoWUD, they have exhibited their positive expectation on the application of the newly established price adjustment provision. Figure 4.14 represents the summary of the responses. In addition, some were good to indicate growth areas that need to be developed in line with the application of the said provision.

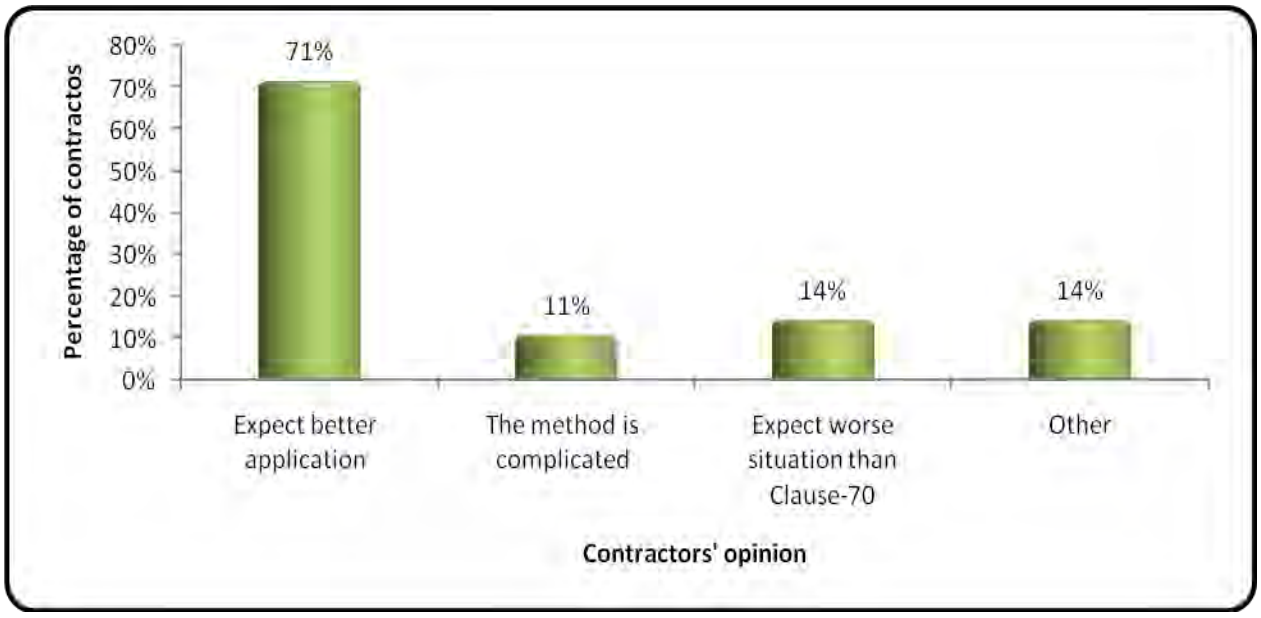

Figure 4.14 Contractors' expectation on the new price adjustment provision

The points indicated by the respondents were: since the most part of its application can be subjective, there must be uniformly applied coefficients for the work items of the construction projects. Also there must be a mechanism to cross check the base price and the current price indices.

4.6 Assessment of contractors' observations and suggestions

In the previous sections, it has been able to see that price fluctuation has been occurring in an unpredictable manner. The type of fluctuation was observed to be

only increase in costs of all inputs of construction. In addition to this, it has been assessed how the contractors are being compensated in cases of price fluctuation.

The surveyed contractors were asked to give their observation on the effect of price fluctuation on themselves considering the pertaining compensation provisions in SCC and the actual practice of compensation.

To this end, 93% of the respondents have said that contractors are forced to suffer the consequences of price fluctuation while they are not supposed to. As described in section 1.3, contractors serve as bridge who serve to deliver service to realize projects which are assigned to them. The benefit they get is the monetary profit they get from the service they deliver in executing the projects of their responsibility. However, contractors lose some portion of their expected profit during unpredictable price fluctuations. Figure 4.15 shows the summary of responses on the effect of price fluctuation on the domestic contractors. Although it is true that contractors lose some portion of their profit, the respondent contractors have exaggerated it. From section 4.5.2.4 it can be seen that the profit loss they are sustaining can be said to be low compared to the customary practice of 15-20% profit margin.

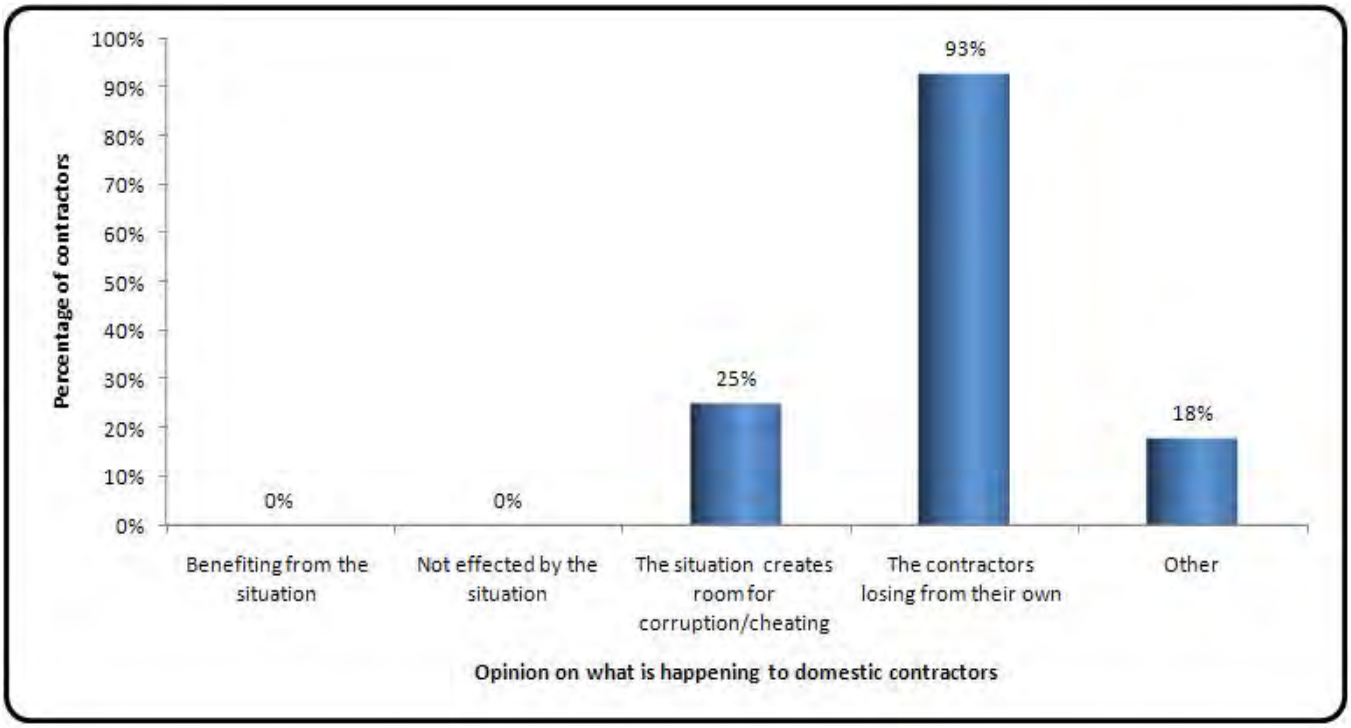

Figure 4.15 Contractors' observation on the effect of price fluctuation on them

In addition to the loss sustained by the contractors, the deliverables of the project face problems manifested in delay and poor quality works. And such poor quality work is concealed in an unethical manner through bribery and corruption.

Regarding what should be done to improve the situation; all agree that the price fluctuation cannot be controlled or stopped, but its adverse effect on construction contractors can be minimized if not totally avoided. To this end the surveyed contractors were asked to give their suggestion on what should be done by contractors, consultants, clients and regulatory bodies.

4.6.1. What contractors should do

Since contractors are being the first victims of price fluctuation, a lot is expected from them. In this regard, 46% of the surveyed contractors have said that to minimize the adverse effect of price fluctuation, they should work hard with others

to bring improvement on the compensation practice while obeying the rules. And the other 32% said that contractors should also propose other improved favorable methods of compensation. Others also suggested that the claiming behavior and capacity of contractors against price fluctuation must be well developed to challenge the project stakeholders. Figure 4.16 represents the result.

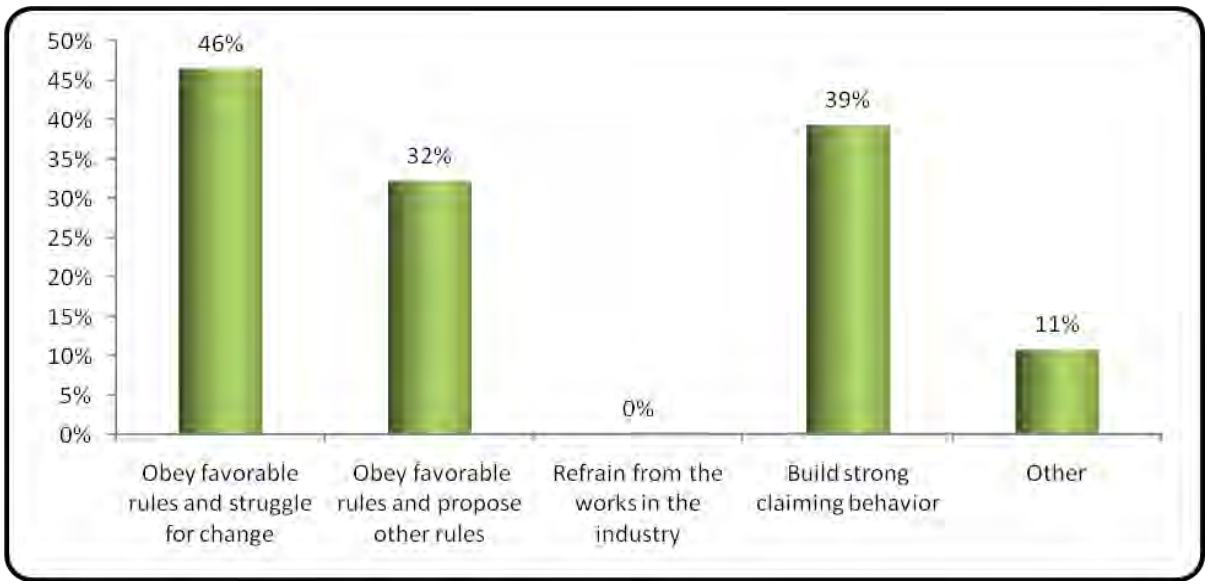

Figure 4.16 Contractors' suggestion: what contractors should do

Even though all the contractors agree that they are victimized by the unfavorable compensation practice, it was surprising to see no one contractor who wants to refrain from the construction business.

4.6.2. What consultants should do

Consultants play a vital role in civil engineering projects from inception to the final commissioning. They also play the biggest role in linking the contractor and the client. Therefore, in case any thing happens to a particular project, it is the consultant who can advise and consult the client to take any action. And in price fluctuation cases also, the consultants are expected to act accordingly.

To this end, 68% of the surveyed contractors suggested that consultants should prepare contract documents allowing for price adjustment. And the other 36% said that consultants should develop and propose other favorable compensation methods to their clients to be applied in cases of price fluctuation.

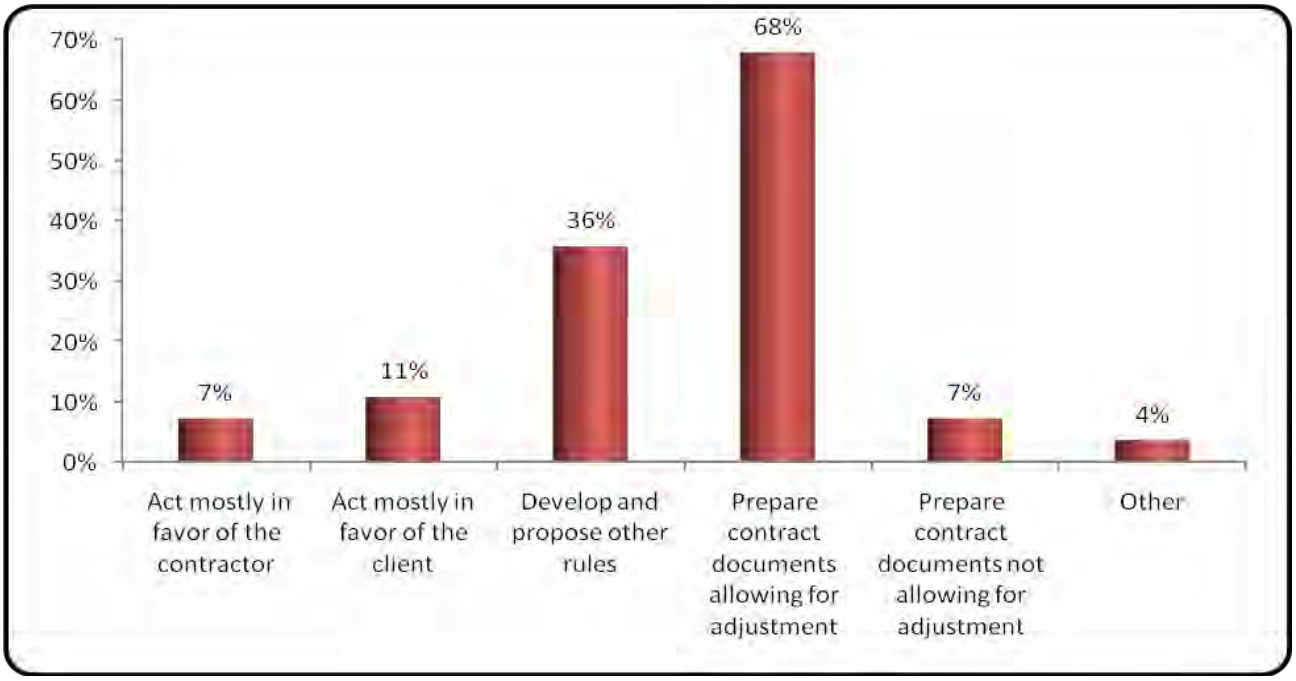

Figure 4.17 Contractors' suggestion: what consultants should do

4.6.3. What clients should do

The first thing that many clients miss is that since the projects are their own, things that happens on due course of the projects are their responsibilities to take. Clients usually seem to throw the burden or consequences of price fluctuation to the contractors undertaking their projects. And this makes contractors to suffer consequences which they are not supposed to take.

Therefore, the surveyed contractors were asked to give their suggestion on what clients should do to minimize or avoid the adverse effect of price fluctuation. To this

end, 79% of the surveyed contractors suggested that clients should be considerate to entertain price fluctuation compensation cases.

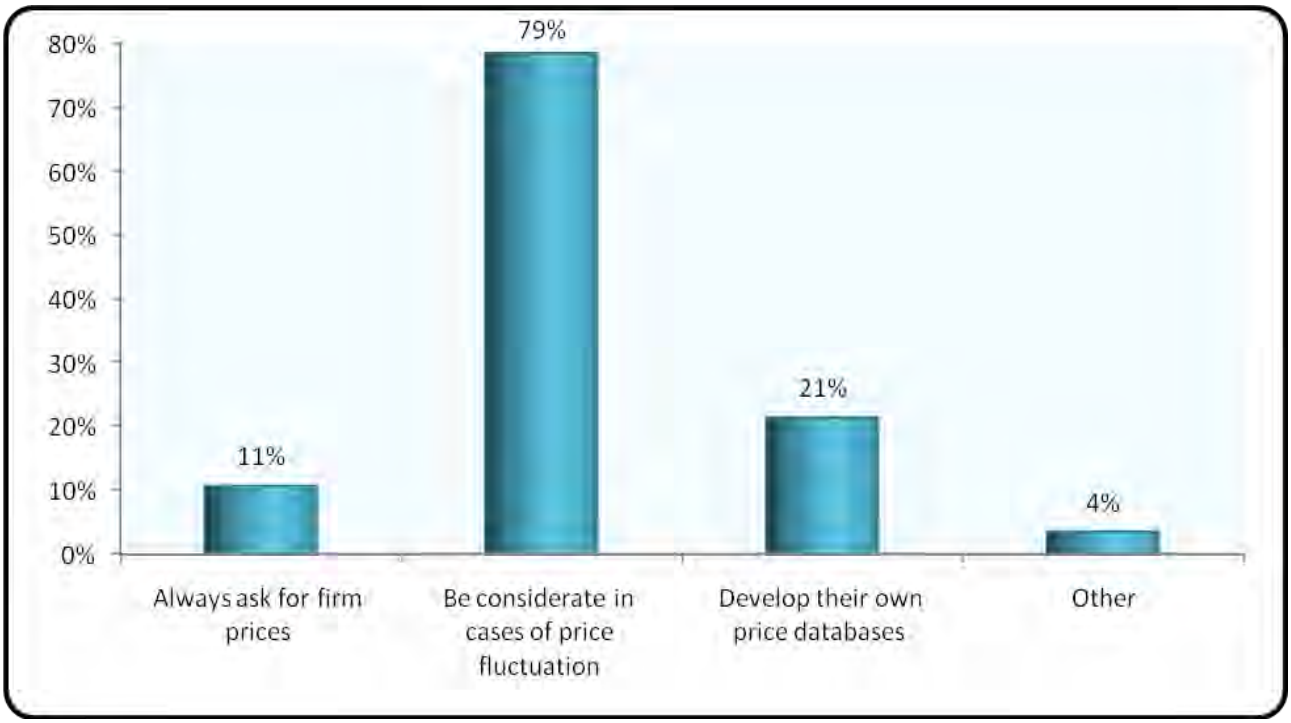

Figure 4.18 Contractors' suggestion: what clients should do

And 21% of the respondents suggested that clients should develop their own price database in order to be used in cases of price fluctuation. This is believed to avoid the problem of having price indices of all times of the project execution time. The base (initial) prices and the current prices of inputs can be easily obtained from these database and used any time.

4.6.4. What regulatory bodies should do

Regulatory bodies may not directly interfere in projects, but they have the power to set standards, rules and regulations through which contractors, consultants and clients should act. They also have the authority to establish price database to be used across the nation.

Therefore, 54% of the surveyed contractors suggested that regulatory bodies should regularly review and amend regulations to make them easily applied and satisfy the need for proper compensation to contractors. And 46% of the respondents said that reliable price database should be developed and updated regularly to be used across the country.

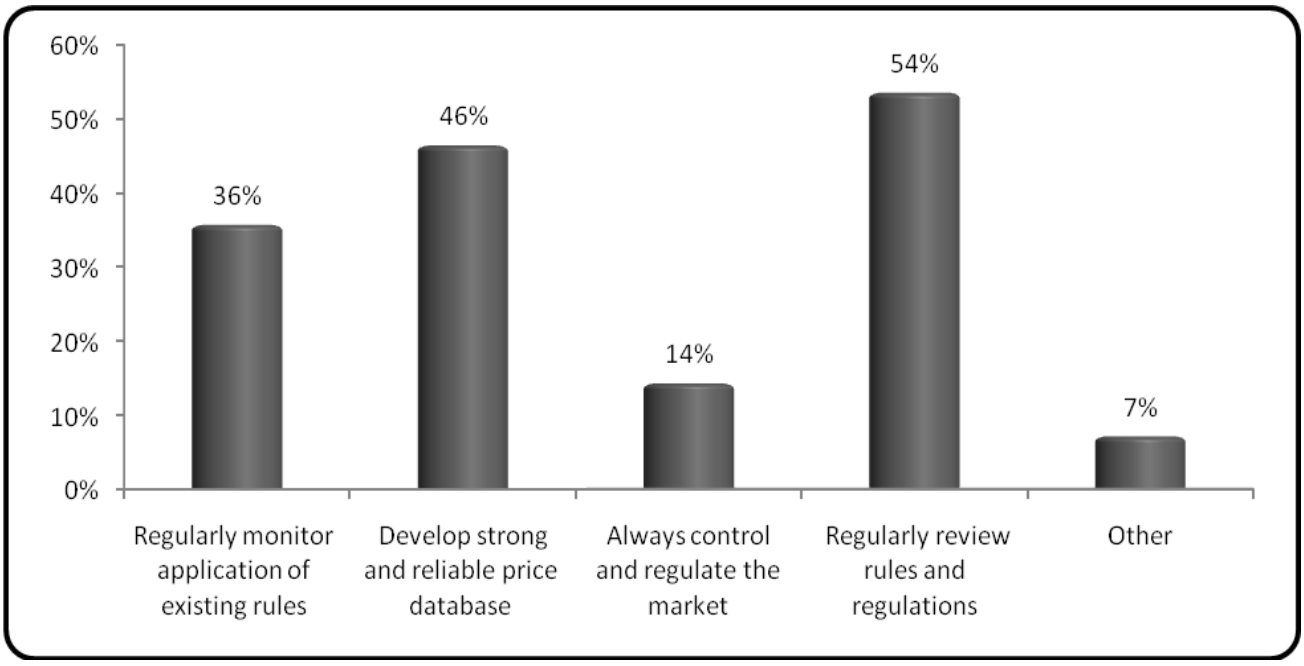

Figure 4.19 Contractors' suggestion: what regulatory bodies should do

There are also suggestions from the contractors for the regulatory bodies to regulate the market and regularly monitor the application of existing rules, which can give them feedback for further improvement of the rules.

5. CASE STUDIES

Two case studies are selected to back up the research basic information showing the extent and effect of unpredicted price fluctuation on the two projects and the construction contractors. One building construction and one road (air field) construction project were considered for the case study.

The study is conducted by collecting data from the projects basic price indices, material requirements, progress reports and material delivery reports. The study focuses on the projects planned and actual expenditures for the major inputs of the construction projects under study. For the building project, the major input is material and for the air field project, the major cost goes to inputs for machinery and equipment. Material cost shares up to 50-55% of the total cost in building projects and 60% of the cost in road projects is for machinery and equipment [Stukhart 1982]. Moreover, the problem of getting data on planned and actual expenditure on labor, equipment (for building), sub contract costs and indirect costs puts a limit to focus only on the above said inputs of the projects. Therefore, data are collected from these documents to see the projects' planned and actual financial expenditure on major construction inputs of the respective projects.

5.1 The case study framework

The framework of the case study is organized in six major steps:

1. List all major materials required for the project with their respective base prices during pricing

2. Provide the actual material procurement and delivery report with the actual purchasing prices of the materials

3. Compare step 1 & step 2 and analyze in one of the four scenarios:

    a. **Scenario 1** No Delay + No Price Change
    b. **Scenario 2** No Delay + Price Change
    c. **Scenario 3** Delay + No Price Change
    d. **Scenario 4** Delay + Price Change

4. Analyze the compensation (if any)

5. Study what the price difference (if any) contributed to the contractor's capacity and to the project's performance

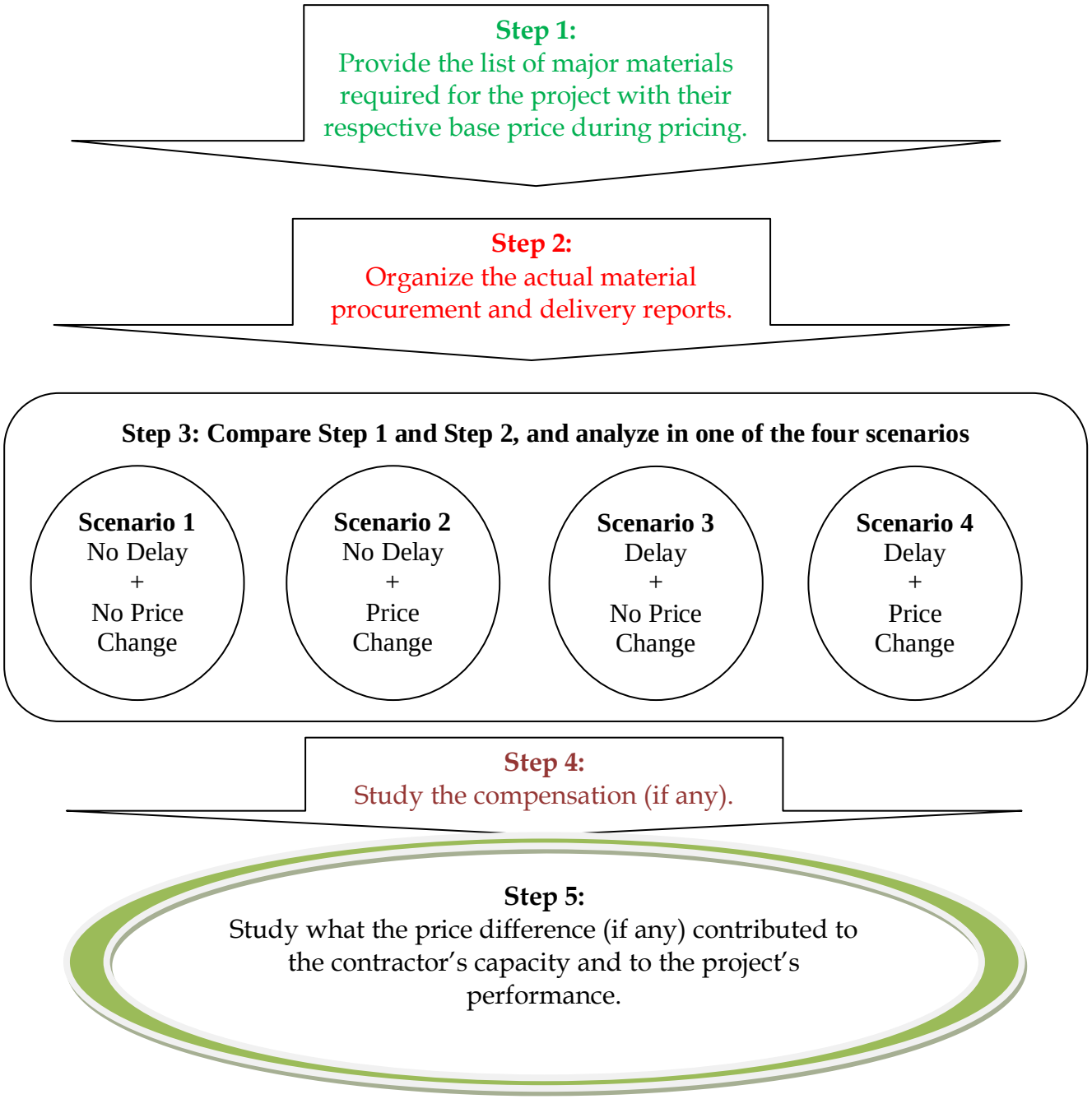

Figure 5.1 The case study framework

5.2 Case Study 1: Building Project

Project basic information:

Project name: Office Building

Contract amount: 28,617,139.42 Eth Birr

Contract time: 730 Calendar days

Completion Date: April 18,2007

Actual amount of work executed on completion: 29,132,712.35 Eth Birr

Actual Completion Date: June 21, 2008 (Sene 14, 2000)

Actual number of days taken to complete the project: 1159 days

5.2.1. Major Planned Project Inputs

As it is discussed in the first section of this chapter, the major inputs in this building project are the different building construction materials. The list of these major building construction materials with their estimated price is presented in table 5.1. The price of the materials is the one which the contractor used for pricing. It was found from the annex in the contract document, basic price of materials list.

Table 5.1 Summary of Material Requirement with Price at the Time of Tender

S/N	Type of material	Unit	Quantity	Unit Price (Birr)	Total Amount (Birr)
1	Cement	Qut	27,500	90.00	2,475,000.00
2	Timber Formwork	m2	21,100	75.00	1,582,500.00
3	Reinforcement bars all diameters	kg	340,000	6.30	2,142,000.00
4	1.5mm black wire	kg	3,900	12.00	46,800.00
5	Nails	kg	633	13.00	8,229.00
6	Brick	pcs	380,000	1.81	687,800.00
8	RHS steel	kg	38,186	9.64	368,112.77
9	Paint	Gal.	2,000	69.00	138,000.00
10	LTZ profile 38mm	pcs	500	105.00	52,500.00
12	Stone	m3	2,000	40.00	80,000.00
13	HCB 20cm	pcs	2,400	3.00	7,200.00
14	PVC tile	m2	2,950	59.00	174,050.00
15	Marble tile	m2	3,000	430.00	1,290,000.00
16	Sand	m3	6,500	100.00	650,000.00
17	Gravel	m3	5,500	90.00	495,000.00
18	Lift supply	No.	1	980,000.00	980,000.00
19	Aluminum curtain wall	m2	120	1,847.00	221,640.00
20	Aluminum doors and windows	m2	1,750	900.00	1,575,000.00
21	Aluminum sky light	m2	110	1,500.00	165,000.00
22	Red ash	m3	1,300.00	48.00	62,400.00
23	selected material	m3	7,000.00	30.00	210,000.00
24	Chipwood	pcs	79.00	75.00	5,925.00
25	Fuel - gasoil	lit	119,000.00	4.33	515,270.00
26	Fuel - benzene	lit	12,000.00	5.51	66,120.00
27	Sanitary materials	LS	1.00	220,000.00	220,000.00
28	Electrical materials	LS	1.00	710,000.00	710,000.00
29	EGA roofing	ml	1,220.00	39.00	47,580.00
30	Gypsum	Qut	400.00	47.00	18,800.00
31	Wood & others for wood work	LS	1.00	13,000.00	13,000.00
32	Bitumen	Barrel	40.00	600.00	24,000.00
33	ADK stucco	bag	220	29	6,380.00
	Total Estimated Cost of Major Materials				**15,038,306.77**
	Contract Amount				**28,617,139.42**
	Percentage of Materials Cost Share				**52.55 %**

The percentage of the material cost of this building construction project is 52.55%, which is found to be within the normal limit which ranges from 50-55%.

5.2.2. Major Project Inputs that are Utilized

The planned quantity of every type material can be compared with the actual quantity of the respective material. Accordingly, it can be seen that the planned and actually utilized quantity of the materials are very close. This shows that the project is well planned and well executed avoiding excessive wastage and under utilization. The material usage is satisfactorily very close to the planned quantity.

The actual amount of materials consumed with the average actual price is summarized in table 5.2.

Table 5.2 Summary of Material Utilized with Actual Average Price

S/N	Type of material	Unit	Quantity	Unit Price	Total Amount
1	Cement PPC	Qut	17,061.00	172.33	2,940,054.60
2	Cement OPC	Qut	10,452.00	153.25*	1,601,812.50
3	Timber Formwork	m2	1,409.30	73.95	104,220.94
4	Black wire	kg	4,650.00	11.50	53,467.00
5	Nails	kg	4,640.00	7.08	32,858.05
6	Brick	pcs	389,809.00	1.07	416,525.63
7	RHS and other steel	kg	12.00	27,391.77	328,701.27
8	Paint - plastic	Gal.	1,689.00	61.64	104,108.16
9	Paint - oil	Gal.	63.00	96.00	6,048.00
10	LTZ seco profile	pcs	4.00	12,014.03	48,056.10
11	Stone	m3	1,806.62	48.04	86,798.24
12	PVC tile	m2	2,318.40	50.00	115,920.00
13	Marble tile	m2	3,968.00	687.10	2,726,427.95
14	Sand	m3	5,780.30	99.12	572,927.00
15	Gravel	m3	5,290.00	118.75	628,200.00
16	Lift supply	No.	1.00	1,130,000.00	1,130,000.00
17	Aluminum curtain wall	m2	110.50	2,200.00	243,100.00
18	Aluminum doors and windows	m2	1,721.20	1,650.00	2,839,980.00
19	Aluminum sky light/ceiling	m2	324.10	2,016.29	653,480.00
20	Eucalyptus wood	pcs	20,111.00	5.26	105,795.50
21	Re bar 6mm	kg	18.50	11.36	210.25
22	Re bar 8mm	kg	51,523.80	9.97	513,838.00
23	Re bar 10mm	kg	81,251.50	7.81	634,200.32
24	Re bar 12mm	kg	34,813.15	9.47	329,561.64
25	Re bar 14mm	kg	12,694.50	8.77	111,318.10
26	Re bar 16mm	kg	9,259.70	9.72	90,025.00
27	Re bar 20mm	kg	63,593.21	8.25	524,334.40
28	Re bar 24mm	kg	86,952.96	8.00	695,476.76
29	Red ash	m3	1,137.10	58.15	66,118.80
30	selected material	m3	6,732.40	47.52	319,923.00
31	Chipwood	pcs	79.00	96.96	7,659.95
32	Fuel - gasoil	lit	107,189.32	5.64	604,869.04
33	Fuel - benzene	lit	12,057.04	7.63	92,031.31
34	Sanitary materials	LS	16.00	13,386.97	214,191.46
35	Electrical materials	LS	26.00	36,327.30	944,509.77
36	EGA roofing	ml	1,214.89	41.28	50,152.79
37	Gypsum	Qut	352.50	135.97	47,927.83
38	Wood & others for wood work	LS	10.00	17,679.40	176,794.00
39	Bitumen	Barrel	45.00	1,300.00	58,500.00
40	ADK stucco	bag	216.00	41.74	9,015.84
	Total Actual Cost of Major Materials				**20,229,139.19**
	Executed Amount of Work				**29,132,712.35**
	Percentage of Materials Cost Share				**69.44%**

**Remark: The price of OPC is lesser than that of PPC b/c OPC was fully purchased from factory, while PPC was purchased partially from factory and partially from retailers.*

5.2.3. Comparison of Planned versus Actual

The first point to check here is in which scenario does this project falls, according to section 5.1 – step 3 of this chapter. The project has taken extra 429 days in addition to the given 730 days. In addition to the delay, the project also suffered material price increases, therefore it falls in the fourth scenario.

From the above two tables, it can be seen that the actual price of materials has increased by 34.52% on due course of the construction of the project. The actual cost share of materials has increased from its planned (estimated) percentage of 52.55% to 69.44% of the total amount of work executed. The total work executed has shown a 1.8% increase, while the material cost share has increased by 16.89%. For this particular project to be completed just at cost, the cost of labor, equipment and overheads must not exceed 30.56% of the total executed amount which is not likely in such trend of market price fluctuation. And still, for the contractor, no profit means a substantial loss for the company has not get financial input to further build its capacity. Rather, the company gets deteriorating from time to time.

In addition to looking at the gross increase in the actual material cost share it is also worth looking into the price increase of individual materials. The following table 5.3, represents the price changes of each material and shows the percentage increase or decrease in the price of each item. The price change is observed to be both in increase and decrease. The fluctuation resulted from a decrease of 45.53% to an increase of 189.29%. However, regarding the major materials that take up more than 2.5% of the cost, the price change was observed to increase by 15.31% to 91.47%, except for the price of sand which has decreases from the planned by 0.88%.

Table 5.3 Summary of Major Material Price Changes

S/N	Type of material	Unit	Quantity	Initial Unit Price	Actual Unit Price	difference	%age
1	Cement PPC	Qut	17,061.00	90.00	172.33	82.33	91.47%
2	Cement OPC	Qut	10,452.00	90.00	153.25	63.25	70.28%
3	Timber Formwork	m2	1,409.30	75.00	73.95	(1.05)	-1.40%
4	Black wire	kg	4,650.00	13.00	11.50	(0.50)	-4.18%
5	Nails	kg	4,640.00	13.00	7.08	(5.92)	-45.53%
6	Brick	pcs	389,809.00	1.81	1.07	(0.74)	-40.96%
7	RHS and other steel	kg	12.00	368,112.77	328,701.27	(39,411.50)	-10.71%
8	Paint - plastic	Gal.	1,689.00	69.00	61.64	(7.36)	-10.67%
9	Paint - oil	Gal.	63.00	69.00	96.00	27.00	39.13%
10	LTZ seco profile	LS	1.00	52,500.00	48,056.13	(4,443.90)	-8.46%
11	Stone	m3	1,806.62	40.00	48.04	8.04	20.11%
12	PVC tile	m2	2,318.40	59.00	50.00	(9.00)	-15.25%
13	Marble tile	m2	3,968.00	430.00	687.10	257.10	59.79%
14	Sand	m3	5,780.30	100.00	99.12	(0.88)	-0.88%
15	Gravel	m3	5,290.00	90.00	118.75	28.75	31.95%
16	Lift supply	No.	1.00	980,000.00	1,130,000.00	150,000.00	15.31%
17	Aluminum curtain wall	m2	110.50	1,847.00	2,200.00	353.00	19.11%
18	Aluminum doors and windows	m2	1,721.20	900.00	1,650.00	750.00	83.33%
19	Aluminum sky light/ceiling	m2	324.10	1,500.00	2,016.29	516.29	34.42%
20	Eucalyptus wood	pcs	20,111.00		5.26		
21	Re bar 6mm	kg	18.50	6.30	11.36	5.06	80.39%
22	Re bar 8mm	kg	51,523.80	6.30	9.97	3.67	58.30%
23	Re bar 10mm	kg	81,251.50	6.30	7.81	1.51	23.90%
24	Re bar 12mm	kg	34,813.15	6.30	9.47	3.17	50.26%
25	Re bar 14mm	kg	12,694.50	6.30	8.77	2.47	39.19%
26	Re bar 16mm	kg	9,259.70	6.30	9.72	3.42	54.32%
27	Re bar 20mm	kg	63,593.21	6.30	8.25	1.95	30.88%
28	Re bar 24mm	kg	86,952.96	6.30	8.00	1.70	26.96%
29	Red ash	m3	1,137.10	48.00	58.15	10.15	21.14%
30	selected material	m3	6,732.40	30.00	47.52	17.52	58.40%
31	Chipwood	pcs	79.00	75.00	96.96	21.96	29.28%
32	Fuel - gasoil	lit	107,189.32	4.33	5.64	1.31	30.32%
33	Fuel - benzene	lit	12,057.04	5.51	7.63	2.12	38.53%
34	Sanitary materials	LS	1.00	220,000.00	214,191.46	(5,808.55)	-2.64%
35	Electrical materials	LS	1.00	710,000.00	944,509.77	234,509.77	33.03%
36	EGA roofing	ml	1,214.89	39.00	41.28	2.28	5.85%
37	Gypsum	Qut	352.50	47.00	135.97	88.97	189.29%
38	Wood & others for wood work	LS	1.00	13,000.00	17,679.40	4,679.40	36.00%
39	Bitumen	Barrel	45.00	600.00	1,300.00	700.00	116.67%
40	ADK stucco	bag	216.00	29.00	41.74	12.74	43.93%

Another critical point worth considering in this particular case is, the price increase of the materials was observed during the late project execution times, after half the contract time has elapsed.

From this it can be learnt that the delay the contractor sustained has pulled the project into a tough time of price fluctuation. If the project was completed on time, the price increase that has occurred would have minimized.

5.2.4. Compensation for price changes

The contractor has received compensation for price increase of cement and reinforcement only. The total increase of cost of the major materials is 5,190,832.42 Birr and the total compensation amount the contractor received is 1,716,685.20 Eth Birr which is only 33.07% of the price increase is compensated. On the other hand, the client did not cut any amount for compensation of price decreases.

5.3 Case Study 2: Road/Airfield Project

Project basic information:

Project: Airfield Construction

Contract amount: 122,967,993 Eth Birr

Contract time: 1140 Calendar days

Completion Date: May 28,2008

Actual amount of work executed to-date: 112,492,261.54 Eth Birr

Actual Completion Date (projected): Dec. 30, 2008 (Tahsas 21, 2001)

Number of Days of potential delay: 216 days

Time extensions granted: nil

5.3.1. Major Planned Project Inputs

As it is discussed in the first section of this chapter, the major inputs in this road project are the different machinery and equipment. In addition, there are also some major materials like cement, reinforcement and bitumen which can be listed along with the equipments as major inputs. The list of these equipments and construction materials with their estimated price is presented in the following tables 5.4 (a) and 5.4 (b). The quantity of the materials and the equipment hours are calculated based on the amount of executed to-date, since the project is not completed. The price of the materials and cost of equipments are the ones which the contractor used for pricing. It was found from the annex in the contract document, basic price of materials list.

Table 5.4 (a) Summary of Material and Equipment Requirement with Price at the Time of Tender

S/N	Type of Input	Unit	Quantity	Unit Price (Birr)	Total Amount (Birr)
1	Cement	Qut	71,517.89	79.00	5,649,913.39
2	Reinforcement bars-all diameters	kg	169,041.44	6.61	1,117,363.93
3	Benzene	lit	100,000.00	5.36	536,000.00
4	Gasoil	lit	5,224,356.16	4.18	21,837,808.73
5	Oil 10W	lit	77,142.46	24.63	1,900,018.74
6	Oil 30W	lit	77,142.46	20.21	1,559,049.07
7	Oil 40W	lit	77,142.46	20.21	1,559,049.07
8	Oil 90W	lit	77,142.46	22.08	1,703,305.47
9	Grease HP103	kg	77,142.46	45.26	3,491,467.64
10	Oil ATF220	lit	77,142.46	28.61	2,207,045.72
11	Asphalt MC-30	lit	88,395.86	1.69	149,737.41
12	Asphalt Cement Grade 60/70	lit	1,068,040.48	1.59	1,701,310.12
	Total				**43,412,069.30**

The equipment cost which is presented in lump sum in the above table is obtained from a detailed breakdown of the equipment requirement of each and every work item of the project. The cost of the equipments is obtained from the company's

standard equipment cost and productivity manual. The following table 4.4 (b) shows the detailed equipment requirement and cost on hourly basis.

Table 5.4 (b) Summary of Equipment Requirement with Cost of Equipments

S/N	Equipment Type	Unit	Working hours	Hourly Cost	Total Cost
1	Crusher	hr	8,490.69	630.00	5,349,133.35
2	Bull dozer	hr	34,689.99	374.50	12,991,399.98
3	Motor grader	hr	24,515.91	101.50	2,488,365.32
4	Loader	hr	8,973.66	94.30	846,216.18
5	Dump truck	hr	68,432.15	58.70	4,016,967.14
6	Water truck	hr	5,992.23	61.10	366,125.06
7	Fuel truck	hr	16,845.59	65.40	1,101,701.70
8	Roller (flat foot)	hr	6,581.35	66.70	438,975.71
9	Roller (Sheep foot)	hr	5,520.74	66.70	368,233.59
10	Pneumatic roller	hr	829.55	587.60	487,441.23
11	Asphalt paver	hr	1,036.93	4,932.50	5,114,669.56
12	Asphalt mix plant	hr	268.38	254.60	68,330.19
13	Asphalt distributor	hr	199.58	197.50	39,417.89
14	Asphalt kettle	hr	199.58	67.00	13,372.14
15	Mobile mixer	hr	4,959.03	74.20	367,960.31
16	Excavator	hr	8,042.79	297.40	2,391,924.42
17	Tamrock drill	hr	1,693.45	114.60	194,069.09
18	Mobile crane	hr	846.72	69.40	58,762.63
19	Carrier truck	hr	846.72	18.66	15,799.87
	Total				**36,718,865.36**

The contractor has set a project cost margin of 80% of the contract amount which is 98,374,394.40 Birr excluding cost of company overhead. As it can be seen in table 5.4 (a), the total planned cost of the project's major inputs is 80,130,934.66 Birr which is 71.23% of the contract amount. The percentage cost share of the above said major inputs falls within the range of cost share stated in the first section of this chapter.

5.3.2. Major Project Inputs that are Utilized

The project under study is not fully completed project. The project has reached 88.20% by the time the study is conducted. The remaining works are only some

crushed aggregate base course, prime coat asphalt, asphalt concrete work and concrete rigid pavement works. The total cost of consumed materials and equipments utilized is compared with the amount of work executed to-date. The actual amount of materials and equipments with the average actual price is summarized in the following table 5.5.

Table 5.5 Summary of Utilization with Actual Average Price

No	Type of material	Unit	Qty	Unit Price	Total Amount
1	Cement OPC	Qut	116,855.00	182.49	21,324,750.00
2	Reinforcement steel	kg	99,280.00	13.36	1,326,244.20
3	Asphalt MC-30	kg	82,709.00	3.85	318,434.41
4	Asphalt 60/70	kg	985,263.00	3.93	3,876,183.07
5	Gasoil	lit	4,184,984.48	5.48	22,942,552.57
6	Benzene	lit	222,793.00	7.32	1,630,093.80
7	Oil	lit	329,770.00	19.83	6,538,642.35
	Sub Total				**57,956,900.41**
	Type of Equipment				
1	Crusher	hr	7,233.91	630.00	4,557,360.40
2	Bull dozer	hr	30,141.73	132.00	3,978,707.96
3	Motor grader	hr	21,331.24	59.00	1,258,543.12
4	Loader	hr	45,440.38	57.90	2,630,997.94
5	Dump truck	hr	112,697.09	58.70	6,615,319.10
6	Water truck	hr	69,281.72	61.10	4,233,113.09
7	Fuel truck	hr	9,007.25	65.40	589,074.15
8	Roller	hr	14,725.10	66.70	982,164.32
10	Pneumatic roller	hr	929.00	66.70	61,964.30
11	Asphalt paver	hr	286.00	587.60	168,053.60
12	Asphalt mix plant	hr	781.00	4,932.80	3,852,516.80
13	Asphalt distributor	hr	254.00	169.00	42,926.00
14	Asphalt kettle	hr	120.00	4.60	552.00
15	Mobile concrete mixer	hr	4,606.96	67.00	308,666.00
16	Excavator	hr	17,992.61	74.20	1,335,051.96
17	Tamrock drill	hr	3,336.35	461.30	1,539,058.63
18	Mobile crane	hr	730.41	114.60	83,704.73
19	Carrier truck	hr	5,247.13	69.40	364,151.00
	Sub Total				**32,643,240.07**
	Total				**90,600,140.48**

5.3.3. Comparison of Planned versus Actual

Here also, the first point to check is in which scenario does this project falls, according to section 5.1 – step 3 of this chapter. The project has a potential delay by 216 days. In addition to the delay, the project also suffered material price increases, therefore it falls in the fourth scenario. However, unlike the previous building project, the increase in price of materials did occurred during the extended time of the project. It has occurred during the contract time long before the completion date was reached.

The individual usage of materials and equipment varies from item to item. Unlike to the building project, the planned and the actual utilization of each input varies in significant amounts. Some inputs are utilized in much higher amount than planned and others are utilized in much smaller amount. Therefore comparison of the plan and the actual is done based on the total cost of these inputs.

To this end, the planned cost of the major inputs to do the project work to the stage it has reached was 80,130,934.66 which is 71.23% of the amount of work executed. And the actual cost of the major inputs to do the project work to the stage it has reached was found to be 90,600,140.48 which is 80.54%, increased by 13.07%. This actual cost already exceeds the total project cost margin the company has set, which indicates the project is being done with substantial loss of profit.

5.3.4. Compensation for Price Changes

The contractor has received compensation for price increase of cement, fuel and bitumen only. The total increase of cost of the major inputs is 14,544,831.10 Birr and there a total cost reduction by 4,075,625.29 Birr for equipment. The contractor has received price escalation compensation of 13,390,573.82 Eth Birr which is 92.06% of the increase occurred.

Table 5.6 Summary of Price Escalation Compensation Payments

S/N	Material	Date	Amount
1	Fuel and Oil	December 7, 2007	1,536,090.82
2	Fuel and Oil	April 9, 2008	1,469,429.90
3	Fuel and Oil	May 9, 2008	718,777.19
4	Fuel and Oil	June 10, 2008	649,348.72
5	Bitumen	July 7, 2008	1,954,234.05
6	Cement	June 27, 2008	6,746,025.55
7	Bitumen	August 1, 2008	316,667.59
	Total		**13,390,573.82**

5.4 Questionnaire Survey Vs Case Studies

The purpose of the case studies was to back the questionnaire survey with more detailed project cases. In light with this, after studying the project cases in the above manner, the results of the questionnaire survey and the case studies were compared to reach to the conclusions of the research. The similarities and disparities of the studies are presented as follows:

Similarities

- It was observed that both studies show that price fluctuation has occurred in an unpredictable manner and the price of materials and inputs increased considerably.
- Compensation for increased price was paid but it was not fully paid. The compensation method for the building and the road projects in the case studies was different. Both studies showed that the compensation system is not consistent.

Disparities

- The case studies showed increases by 34.52% for the building and 13.07% for the road project. While the questionnaire survey showed the increase was rated to be by more than 50%.
- In the questionnaire survey the respondent contractors said delay was the major effect of price fluctuation. But the case studies showed that the delay caused by the contractors made them vulnerable to price increases and suffer the consequences of price increases.
- Profit loss calculated from the questionnaire survey was much lower than the one calculated in the case studies. The case studies showed that contractors lose considerable amount of profit due to price increases.

6. CONCLUSIONS AND RECOMMENDATIONS

This research has examined the various factors how domestic contractors are faced with unpredictable price fluctuations. The findings of the research, have been summarized under two parts. The causal factors and the effects of unpredictable price fluctuations are presented under the conclusion part while the proposals of ideas and knowledge to minimize the adverse effects of unpredictable price fluctuations on the capacity of contractors are presented under the recommendation part.

6.1 Conclusions

1. The research has shown that price fluctuation occurs any time; but the magnitude and occurrence time of price fluctuation, whether increase or decrease in price, is the most difficult to predict. ***It is difficult to predict accurately and determine how the price of materials would increase or decrease***. Even during high times of price fluctuation, it is very difficult to predict whether the then current prices will rise or fall or stay fairly constant.

2. The pattern of price fluctuation that has been occurring almost all the time is the ***increase in prices***. The research has revealed that the price of materials used to exhibit a very high increase (by more than 34%) and that of skilled labor exhibited very high increase (by 30-50%) over the past three years. The increase in price of construction inputs might be taken as healthy, provided that it is fairly going in equal magnitude as the overall inflation, and yet where the inflation is healthy. However, the rate of increase in price of construction inputs is much higher than the overall inflation of the country which makes the sector very risky to do business.

3. During bid pricing, contractors collect data mostly by direct market survey and use the information for pricing. It has been said that it is difficult to predict the occurrence and magnitude of price fluctuation, but, from experience contractors feel that prices would rise. However, even though they feel prices would rise, they do not want to take into consideration during bid pricing. This is due to two reasons:
    i. The pertaining conditions of contract allow them to use current price at the time of tender, not the forecasted or predicted prices
    ii. Contractors who try to predict, if they can, and use the forecasted prices will definitely be the one who offer high prices, which makes them unsuccessful in bids

    Therefore, contractors do not take price fluctuation factors into consideration during pricing.

4. The price fluctuation system that is being applied in the country is very narrow which is limited to few construction inputs. Even though civil engineering construction inputs are quite many in number and type, the Ethiopian government has allowed only four types of materials for compensation. Skilled and unskilled labor, local construction materials and other construction materials which are not allowed for compensation have exhibited considerable price increase by greater than 30%.

5. Price fluctuation claims handling procedures are not consistent across all consultants and clients. Such claims are being handled by the subjective decisions of the respective consultant and/or client.

6. Due to the narrow compensation system and denial for compensation, contractors loose considerable amount from their profit. Though it is not a representative figure, the research has revealed that contractors have lost an

average profit loss which amounts 2.43% of the total project cost. The profit loss trend is also getting increased from year to year.

7. The profit the contractor gets is partially used to build the capacity of the contractor with respect to equipment, competent professionals, working capital and others. But if the contractor does not get adequate profit from the projects it undertakes, the capacity of the company will decline. This research shows that contractors' profit loss due to unpredictable price fluctuation has created difficulty on contractors to build their capacity.

8. The poor compensation system and profit loss in its complete set of negative effects, does not only affect contractors. The project deliverables also suffer from the adverse effects of unpredicted price fluctuations. Delays are common as a result of loss of working capital and capacity of the contractor to persist during price increases. Also contractors compromise on quality to economize the inputs and minimize the loss they suffer.

9. So far it has been seen that price fluctuation is difficult to predict and contractors are being affected negatively. However, the most surprising finding of this research is that no one contractor wants to step out of the construction business.

6.2 Recommendations

Developing the domestic contractor's capacity eventually leads to strengthening the construction industry. The goal of this research is to study the effect of unpredictable price fluctuation on the capacity of construction contractors and propose ideas that would reduce the adverse effects on the construction contractors. To this end the

following recommendations are forwarded to reduce the adverse effects of price fluctuation:

1. Update control information continually with current prices, indices, and trends. A comprehensive and reliable price database should be established by joint effort of all actors of the construction industry. The database should be updated regularly at short time interval to give realistic price data. The government must take the initiative to coordinate the stakeholders and establish a legal body to undertake this activity.

2. Contractors, consultants, owners and regulatory bodies should work together to improve the compensation system in which a wider range of inputs will be allowed for compensation. The method of price fluctuation compensation estimation/calculation should be clear and consistent across all contractors, consultants, regulatory bodies and clients.

3. Contractors should be committed to undertake the project activities on time avoiding delays. It is observed that when time passes and projects delay, the magnitude and effect of price fluctuation (price increase) increases. Therefore, it is strongly recommended for the contractors to undertake their projects on time.

4. Closely scrutinize payment schedules. Contractors can suffer severely under price fluctuation and high interest rates if payments are delayed. Owners should be committed to effect payments timely.

5. The time gap from contract agreement to commencement should be minimized. Finalize all the necessary administrative requirements on contract award and at the project site prior to bidding in order not to waste the time

after contractors have given their offer. Extended time wasted in such activities pushes the contractors to face challenges of increased price. Contractors should start work with in minimum time after contract agreement.

6. Contractors should improve their financial utilization system. They should identify and purchase items whose prices are likely to increase or be in short supply. They should utilize the advance payment they receive for similar purpose for the same project.

7. Subdivide large risky venture into several smaller ones at prices more manageable and foreseeable. The total huge risk will be reduced into smaller ones enabling the contractors control the projects and minimize the risk of price increase. Here the total project time also reduces which again reduce the risk of price fluctuation.

8. Reduce costs through improved material and financial management techniques, more effective use of other resources and cost effective reductions in overhead. This includes adopting technologies that enable to use cheap and less quantity of inputs.

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Appendix

Questionnaire Survey - Prepared for construction contractors

Study on the Effect of Unpredictable Price Fluctuation on the Capacity of Construction Contractors

General Information

This research survey is designed to fulfill an academic requirement for an M.Sc program in Construction Technology and Management at the Addis Ababa University. I can assure you that the research data will only be used for academic purposes. Particular mentioning of names will not be required anywhere. Your open and prompt response is highly appreciated.

For any clarification on this questionnaire, please contact the researcher on **09 11 67 04 85 (Asteway Yigezu)**

Objective of the research

The objectives of the thesis research are:

- To identify the possible causes of price fluctuations in the market
- To study the relationship between price fluctuations and capacity of construction contractors
- To investigate the effect of price fluctuations on the capacity of construction contractors
- To seek for possible preventative strategies to minimize potential adverse effects

General Definitions

- ***Price Fluctuation*** – Increase or decrease of price of materials, equipments machinery and services/labor on market.
- ***Capacity*** – Organization's ability for executing a given work, with in the limit of the given grade, in very good quality and time by availing all the required machinery, equipment, labor, professionals and all the required logistics.
- ***EC*** – Ethiopian Calendar

Part I – General / Organization Information, Market Price Fluctuation and Pricing

1. Name and category/class of the construction company (optional) _____

   _____

2. Position, qualification and experience of the respondent _____

3. Total cost of project currently at hand (please complete the table below)

Year (EC)	Total contract amount (x1000 Birr)	Net amount executed in the year(x1000 Birr)	Remaining amount of work(x1000 Birr)	Remark
1999				
1998				
1997				

4. How do you see the nature of occurrence of the price fluctuation you have encountered? (Mark in the corresponding cell)

Degree of Predictability (%)	Material	Labor	Machinery/Equipment
Highly predictable / 81-100			
Predictable / 61-80			
Fairly predictable / 41-60			
Less predictable / 21-40			
Unpredictable / 0-20			

5. What are the major construction inputs you have encountered price fluctuation since 1997 EC? Specify at lease seven materials, and rate according to the table.

S/N	Description	Major (>50%)		Very High (30-50%)		High (20-30%)		Moderate (10-20%)		Minor (0-10%)	
		Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1	Materials										
	•										
	•										
	•										
	•										
	•										
	•										
	•										
	•										
2	Labor										
	• Skilled										
	• Unskilled										
3	Equipment										
4	Overheads										

6. What method or technique do you use for pricing?
   a. Analogous estimation _____
   b. Parametric modeling _____
   c. Bottom-up estimation _____
   d. Computerized tools _____
   e. Others / please specify _____

   _____

   _____

7. Have you ever tried to anticipate or predict price fluctuation of any kind and used it as an input during pricing?

   Yes ____ No ____

   i. If Yes, which of the methods do you use accommodate price fluctuation?
      a) Introducing risk factor _____
      b) Conducting risk analysis for planning _____
      c) Adopting high profit margin _____
      d) Other methods (please specify) _____

   _____

   _____

   ii. If No, why?

   _____

   _____

   Which of the data sources, that publish or disclose basic price information, do you use for pricing?

   a. Simple market survey _____
   b. Central Statistics Agency publications _____
   c. National Construction Magazine by ECCA _____
   d. Other sources (please specify) _____

   _____

Part II – Particulars / Compensation Related Issues

8. Please specify the estimated amount of loss or gain due to price fluctuation since 1997EC? Please give your response according to the following table.

Year (EC)	Total project cost (x1000 Birr)	Financial gain due to price reduction (x1000 Birr)				Total gain	Financial loss due to price increase (x1000 Birr)				Total loss
		Materials	Labor	Equipment	Overheads		Materials	Labor	Equipment	Overheads	
1999											
1998											
1997											

9. For which of the construction inputs have you received compensation payments since 1997 EC? Please give your response according to the following table.

S/N	Description	Compensated	Not compensated
1	Materials		
	•		
	•		
	•		
	•		
	•		
	•		
	•		
2	Labor		
	• Skilled		
	• Unskilled		
3	Equipment		
4	Overheads		

10. What was the reason for being denied for compensation, for items not compensated?

    a. Price fluctuation could not be justified by consultant/client ___
    b. The contracts did not allow for compensation ___
    c. Compensation for those items is not allowed by law or regulation ___
    d. Other reason/please specify _____

    _____

    What actions do you take in the events of price fluctuation?

    a. Absorb the effect in the profit margin _____
    b. Claim for compensation payment _____
    c. Other (please specify) _____

11. Describe the impact of the action you took (in Q #11) in response to price fluctuation:
    a. On the overall performance of the project

    _____

    _____

    b. On the capacity of your company

    _____

    _____

12. What was the total amount of price escalation compensation payment you requested since 1997EC? Please give your response according to the following table.

Year	**Total project cost (x1000 Birr)**	**Price escalation compensation payment requested for (x1000 Birr)**				**Total amount requested (x1000 Birr)**
		Materials	Labor	Equipment	Overheads	
1999						
1998						
1997						

13. What was the total amount of price escalation compensation payment paid to your company in response to your request in Q # 14? Please give your response according to the following table.

Year	**Total project cost (x1000 Birr)**	**Price escalation compensation payment paid (x1000 Birr)**				**Total amount paid (x1000 Birr)**
		Materials	Labor	Equipment	Overheads	
1999						
1998						
1997						

14. If only portion of the requested amount is paid, please briefly explain why the amount in difference is not paid.

    _____

    _____

15. What is your opinion on the application of Clause 70 of the Ethiopian Standard Conditions of Contract?
    a. It is well applied _____
    b. It is not well applied _____
    c. It is easy to apply _____
    d. It is not easy to apply _____
    e. Other/please specify _____

    _____

16. What is your opinion on the omission Clause 70 of the ESCC? and the application of the newly adopted price adjustment method in Clause 47?
    a. The omission of Clause 70 is good _____
    b. Clause 70 should not be omitted _____
    c. Clause 70 should have been amended* _____
    d. Other/please specify _____

    _____

    ** - amendment is to consider price fluctuations occurred for reasons other than by law or legislation.*

17. What is your opinion on the application of the newly adopted price adjustment method in Clause 47?
    a. I expect better application _____
    b. The method is complicated _____
    c. I expect worse situation than Clause-70 _____
    d. Other/please specify _____

    _____

Part III – Particulars / Capacity Related Issues

18. When did you last upgrade your class / category?
    a. Between the past two years _____
    b. Between the past 2 to 4 years _____
    c. Between the past 4 to 6 years _____
    d. Between the past 6 to 8 years _____
    e. Before 8 years _____
19. When did you last upgraded your working capacity? Please give your response according to the following table / mark in the appropriate cell.

During the last	With respect to		
	Machinery/Equipment	**Organization structure**	**Office and other logistics**
2 years			
2 to 4 years			
4 to 6 years			
6 to 8 years			
Before 8 years			

20. If you haven't upgraded your class / category or working capacity, briefly explain why.

    _____

    _____

    _____

21. In your opinion, what do you think is happening to domestic contractors as a result of price fluctuation?
    a. Benefiting from the situation _____
    b. Not affected by the situation _____
    c. The situation created room for corruption/cheating _____
    d. The contractors losing from their own _____
    e. Other/please specify _____

    _____

22. What do you suggest that contractors, consultants, clients and regulatory bodies should do, to prevent the adverse effect contractors sustain due to price fluctuation?

24.1 Contractors

a. Obey favorable rules and struggle for change _____
b. Obey favorable rules and propose other rules _____
c. Refrain from the works in the industry _____
d. Build strong claiming behavior _____

e. Other/please specify _____

24.2 Consultants

a. Act mostly in favor of the contractor _____
b. Act mostly in favor of the client _____
c. Develop and propose other rules _____
d. Prepare contract documents allowing for adjustment _____
e. Prepare contract documents not allowing for adjustment _____

f. Other/please specify _____

24.3 Clients

a. Always ask for firm prices _____
b. Be considerate in cases of price fluctuation _____
c. Develop their own price databases _____

d. Other/please specify _____

24.4 Regulatory bodies

a. Regularly monitor application of existing rules _____
b. Develop strong and reliable price database _____
c. Always control and regulate the market _____
d. Regularly review rules and regulations _____
e. Other/please specify _____

~~~~~ THANK YOU ~~~~~
~~~~~

SIGNED DECLARATION SHEET

Submitted By

_____	_____	_____
Student	Signature	Date

Approved By

1. _____	_____	_____
Advisor	Signature	Date
2. _____	_____	_____
Chairman, Dept's Graduate Committee	Signature	Date
3. _____	_____	_____
Chairman, Faculty's Graduate Committee	Signature	Date
4. _____	_____	_____
Dean, Graduate School	Signature	Date

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university. All sources of materials used for the thesis have been duly acknowledged.

Name: **Asteway Yigezu**

Signature: _____

Place: Addis Ababa University, School of Graduate Studies
Faculty of Technology
Department of Civil Engineering

Date: December 28, 2008