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Investigating the Effect of Currency Devaluation on Contractors: A Case Study on Selected Public Building Projects

By

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CERTIFICATION

The undersigned have examined the thesis titled **'Investigating the Effect of Currency Devaluation on Contractors: A Case Study on Selected Public Building Projects'** presented by Haimanot Nibret Mengistu, a candidate for the degree of master of Science, and hereby certify that is worthy of acceptance.

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DECLARATION

I hereby declare that this thesis prepared for the partial fulfillment of the requirements for the degree of **Master of science in construction Management** titled **'Investigating the Effect of Currency Devaluation on Contractors: A Case Study on Selected Public Building Projects'** is my original research work and has not been submitted for the granting of any other degree or other equivalent titles at any other institution of higher learning, and all resources utilized here have been appropriately acknowledged.

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ABSTRACT

The National Bank of Ethiopia devalued Birr by 15% against United States Dollar (USD) in October 2017. Since then, the construction industry in Ethiopia has faced price volatility on construction materials. According to prior studies, the construction industry is influenced by currency devaluation, resulting in high inflation, volatile market pricing, and material shortages. This price increase causes contractors to fail in finishing their projects within the acceptable time and quality boundaries, as well as within the anticipated cost boundary. This delays their progress in every way. However, the extent of the impact on construction projects is not well-understood and needs to be studied more closely. Therefore, the main objective of this study is to investigate the effect of currency devaluation on contractors. In particular, this paper aims to determine the effect of currency devaluation on public building projects that were commenced before currency devaluation occurred. It also focuses on contributory trade of works induced by currency devaluation and minimizing the risk of economic loss in construction projects due to currency devaluation for current and future occurrences. Based on a review of literature on the effect of currency devaluation on the Ethiopian construction sector and other countries' currency devaluation issues and measures, a case study research technique was utilized. Secondary data was obtained through document review. Analysis of data demonstrated the impact of the construction project, contributory trade, and strategies that the government should enforce to minimize the risk of devaluation on contractors. The result reviled that the construction cost of four public building projects in Addis Ababa increased by 18.12%, 17.72%, 16.51% and 13.94% because of the price escalation of construction materials tied to the currency devaluation of the Birr. Further, reinforced concrete work, wall and floor finishing work were found contributory to currency devaluation. The study concludes that compensating contractors who work for government projects and were adversely affected by the recent economic legislation adopted by the Government during 2017 to tackle the current crisis and adjusting the value of most contributory trade of works induced by currency devaluation to be increased or decreased based on an index minimizes the risk resulting from currency fluctuation for the future occurrence. On this basis, the government of Ethiopia should pass decisions that allow contracts to be increased or decreased, based on a price index.

Keywords: Currency Devaluation, Construction Materials, Construction Industry

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ABBREVIATION

BOQ	Bill of Quantity
CSA	Central Statistics Agency
EEA	Ethiopian Economic Association
EFCBC	Head of the Egyptian Federation for Construction and Building Contractors
ERA	Ethiopian Roade Authority
GDP	Gross Domestic Product
IMF	International Monetary Fund
MDUC	Ministry of Urban Development and Construction Works
NBE	National Bank of Ethiopia
PA	Price Adjustment
PAI	Price Adjustment Index
RHS	Rectangular Hollow Section
USD	United States Dollar
VAT	Value Added Tax
WB	World Bank

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CHAPTER ONE: INTRODUCTION

1.1. Background of the study

Construction is a massive, dynamic, and sophisticated industry. It is responsible for physical development and/or changes in the environment, making the built environment critical to the country's socioeconomic development. It consists of building, civil and heavy engineering work, and encourages industry to be the main stimulus of an economy. According to the World Bank, the industry accounts for 3 to 8% of developing countries' Gross Domestic Product (GDP) (Oladipo, 2012). The construction sector plays an important role in the transformation and industrialization of a nation. The construction sector in Ethiopia and generally in the world, contributes to the realization of about 50% of the total capital. Being the second largest employer in the country, it's also a driving force for technology, innovation and general growth (Shewangzaw, 2012).

As per Shewangzaw, (2012) the Ethiopian government identified the construction industry as one of the three sectors of the economy, which needs special consideration to promote the country's economic development. On the other hand, the domestic construction industry in Ethiopia is still suffering from inadequate capital base, old & low levels of equipment availability and utilization, and limited experience and participation in the construction and consultation works.

However, the industry being one of the major contributors to the economy, it is subjected to cost and time overruns. several economic indicators can be used to evaluate and/or affect the overall cost of construction. This includes exchange rate of local currency, inflation rate, and interest rate charge on loans etc. (Oladipo, 2012).Foreign exchange and its inherent difficulties in the construction sector, as well as the requirement for local sourcing of building materials account for about 60% of total construction costs, which requires special attention (Oladipo, 2012).

Oladipo, (2012) stated that high construction prices have become a key sign of the construction industry's failure. It has appeared in low construction activities and abandoned projects have severe implications on the country's socio-economic and technological development. The need for building materials necessitates a significant amount of foreign investment, as well as the use of machinery and spare parts. As a result, when the country's currency causes a snag in the foreign exchange market,

construction material producers are left out in the cold. According to Oladipo, (2012) currency devaluation in the past few years has adversely impacted construction materials prices.

In Ethiopian context, MoUDC, (2012) stated that the construction industry is highly dependent on imported materials. (ITE Build & Interiors n.d.) also added that up to 70% of all construction materials required in Ethiopia is imported. which makes is import dependent. Thus, currency devaluation causes imports to be costly and since the capacity of local construction material producers is very low, its effect is huge on the industry.

Generally, it is critical to have better knowledge of the impact of currency devaluation on public construction projects. In order to execute projects based on planned time, cost, and quality, especially when projects are scheduled to be executed without taking into account the country's uncertain risk and not including the possibility of price adjustment in the contract. In such a scenario, the contractors should have included a 3 to 5% risk allowance to overcome this situation, but if they do, they will lose their bid. Therefore, its impact affects project owners, contractors, and the supply chain.

The research's main objective is originated from understanding of currency devaluation relationship between inflation and price escalation of construction materials. In particular, this paper aims at addressing the effect of currency devaluation on public building projects and ways to minimize it.

1.2. Statement of the problem

National Bank of Ethiopia (NBE) declared a devaluation of the national currency on October 10, 2017, making imported products more costly in domestic markets. As a result, new orders for imports, as well as those that have already been imported and are presently in stock, saw immediate price increases due to the rate of devaluation. Unsurprisingly, in one way or the other, devaluation activates an upward inflationary pressure since the Ethiopian construction industry is reliant on foreign import, which will result in higher construction prices (Dil Tour & Travel, 2017).

Typically, huge number of building projects in Ethiopia have inefficiencies such as high construction input costs due to import fees and high foreign exchange rates, necessitating more investment in the private and governmental sectors (Alliance Experts, n.d.).

According to Yigezu, (2008) the Ethiopian construction industry is experiencing market price fluctuation, variably arising from sharp price increments, leading contractors to failure in completing their projects within an acceptable boundary of time and quality for the client and failing to complete them within the planned cost boundary. This hinders their progress in all aspects.

Regmi, (2017) stated contractors are mainly involved in diversified activities that are directly affected by existing market situation. In this respect, the overall business environment comes into picture, affecting contractors in many aspects; performance and capacity being the crucial ones.

EEA (2008) reported the majority of construction contractors (92.7%) were low-grade contractors (5 to 10) with an annual construction capacity of only 5 million and less, while 5.2% of contractors were grade 3 to 4 with an annual capacity of between 5 million and 15 million. The rest (2.1%) were grade 1 &-2 contractors with an annual construction capacity above 15 million birrs. This indicates that there are very few high-capacity contractors in the country. This appeal shows the necessity to strengthen the financial, technical & managerial capabilities of domestic contractors to enable them and become competitive in the market. However, due to currency devaluation, energy expended on capacity building of domestic contractors is wasted (Habcon Consult, 2018). Contractor capability issues have been highlighted as the most common building construction obstacles in the sector (Anshebo, 2017).

According to Vendors, (2016) due to local currency devaluation, there is a high cost of housing and properties as a result of the high cost of materials and high cost of production. To stay profitable, construction companies go beyond these additional costs incurred by the market.

Government policies, insufficient funds, donor shortages of foreign exchange, inappropriate contract terms, political priorities, poverty, socio-cultural conditions, corruption, low institutional & human capacity and occurrence of unforeseen events have been identified as major factors contributing to poor project performance in developing countries (Yimam, et al , 2011).

As per Bekele, (2018) report chemical and building materials exports have been hindered by the fluctuating foreign currency shortage. There are numerous problems confronting the chemical and construction inputs production industry. For example, a lack of foreign currency, raw materials and inconsistent power supply are some of the key variables affecting the sector's productivity.

Yigezu, (2008) stated as a contractor is the main stakeholder executing a project, they are first to face the problems and challenges in their operations within the construction industry. Physical resources (Materials and Machinery), labor, cash, and information are the key resource elements that must be addressed in the building of a project. Devaluation unwaveringly affects the contractor.

Labata, (2019) Wrote the price level in the country is raised as a result of devaluation, which accordingly increases the rate of inflation. The effects of inflation can lead to loss of profit for contractors and higher cost overrun to project owners. Furthermore, a construction project will expose the risk of inflationary cost increases due to the factors which cause project delays. There are limited empirical studies and articles that have been undertaken regarding currency devaluation on public construction projects. Research depicting the basic effect of devaluation is another aspect to be considered.

This paper will try to fill the gap in the literature review by observing other countries approach that were adversely affected by recent economic legislation. It will look in depth at how these economic decisions created a financial imbalance in the construction, supply and public service contracts. A case study will be used to illustrate the challenges or barriers that construction projects faced with the 2017 devaluation of the birr. Finally, it analyzes the impact on construction projects by using price escalation of construction material inputs, contributory trade of works induced by currency devaluation, and discusses the approaches that can be used to minimize the risk of economic loss in construction projects resulting from devaluation.

Therefore, this study investigates the impact of currency devaluation on construction projects and examines whether project implementation process addresses the impact of currency devaluation. The research is needed to identify methods and prevent such incidents from happening in the future.

1.3. Objectives of the Study

1.3.1. General Objective

The major objective of this study is to investigate the effect of devaluation on contractors by using a case study on selected public building projects.

1.3.2. Specific Objectives

- Identify the effects of currency devaluation on public building projects by using the price change of construction materials.
- Identify the most contributory trade of works induced by currency devaluation in public buildings.
- Identify methods to minimize current situation and mitigate long-run (future) occurrence to public buildings.

1.4. Research Questions

1. What are the effects of devaluation on selected public building projects?
2. Which trade work is affected by the currency devaluation?
3. How can the adverse effects of the recent devaluation be minimized?

1.5. Scope of the Study

Due to limited resources (finance and time), the scope of the study is limited only to public building construction projects being executed in Addis Ababa. The study focuses on the effect of currency devaluation on construction projects and/or major construction works. Other specialized construction works like joinery and carpentry will not be covered under this study.

1.6. Significance of the Study

The implications of the study on minimizing the effect of devaluation on contractors, specifically a case study on selected building projects, could have a negative impact on the construction industry. Rising costs for construction materials, rebar, fuel, etc. have resulted in a sharp rise in the price of construction materials and delays in projects. However, reducing this problem and its impact on contractors has not been studied in depth. Therefore, this study is expected to solve problems related to currency devaluation for current situation and future occurrence.

Overall, this study will have a significant impact on the value of the exchange rate management system. It is necessary that the country's policymakers and government entities take major corrective actions to address the repercussions of the currency devaluation crisis on the industry.

1.7. Limitation of the Study

The major potential limitation of the study was scarcity of literature regarding studies on the effect of devaluation on construction projects and unavailability of construction materials price data base.

1.8. Organization of the Study

This study will be structured into five chapters. The first chapter will incorporate introduction, statement of the problem and objective of the study. The theoretical & conceptual literature on currency devaluation, effect of currency devaluation on the construction industry, as well as other countries' currency devaluation & measures, possible ways to minimize the effect of currency devaluation will be reviewed in Chapter two. The third chapter will discuss research methodology, the approach adopted in planning and conducting research and methods for data collection and analysis. Chapter four will present the results and findings of the collected data through a case study. Concisely, the conclusions and recommendations will be deliberated on in chapter five.

CHAPTER TWO: CONCEPTUAL & CONTEXTUAL LITERATURE REVIEW

2.1. Introduction

This section identifies, evaluates and integrates conceptual and contextual published significant data /file on currency devaluation, causes, advantages, disadvantages, positive and negative effects of currency devaluation on construction industry and other countries currency devaluation issues and measures, which is helpful achieving the goal of this study. besides essential data for analysis and discussion will be illustrated.

2.2. The Concept of Devaluation and Construction Industry in Ethiopia

A decline in the exchange rate or value of a country's currency in terms of foreign currency is referred to as devaluation. The government devalues currencies to lower the cost of exporting to the foreign market. It is seen as a way to boost a country's competitiveness. It increases the attractiveness of domestically produced items overseas while decreasing the attractiveness of foreign goods at home. This shifts the attractiveness of traded goods, causing the number of exports to rise while imports fall, resulting in an improvement in the trade balance (Krugman, 1999).

In other words, devaluation is an official reduction in the value of a country's currency in relation to another currency, group of currencies, or standard. Devaluation, on the other hand, is a way of allowing the devaluating country to lose some proportion of the value of its currency in relation to the dollar or any other currency (Umer, 2015).

2.2.1. Overview of Devaluation in Ethiopia

Due to their exposure to external economic shocks, developing countries have long seen the exchange rate as a fundamental policy concern over the years. External economic shocks, it is believed, contribute to the worsening of the trade balance, internal inflationary pressure and the overall competitive position of developing nations (Eshetu, 2017). The legitimate currency of Ethiopia was introduced on 23 July, 1945 at an official exchange rate of 2.48 birr per US dollar. After nearly two decades, on 1 January1964, the Ethiopian birr was somewhat devalued to 2.50 birr per US dollar. The Ethiopian birr was revalued

to 2.07 birr per US dollar due to the failure of the Bretton Woods System in 1973. Since then, the Ethiopian currency has been linked to the US dollar at a rate of 2.07 birr per dollar until the October 1992 devaluation (Eshetu, 2017).

According to Eshetu, (2017) the Ethiopian landscape was dramatically altered by massive economic and political developments in May 1991. The military regime that tormented the country for 17 years crumbled, and Ethiopia's transitional government took over political authority. Foreign trade and exchange rate regimes were liberalized under the new reform agenda. Then Ethiopia's national currency was devalued by 142 percent in October 1992, from its fixed rate of 2.07 per US dollar to 5 per US dollar, marking the first significant shift in the value of the birr. Currency depreciation is intended to reduce external imbalances, promote production growth in general, and raise export growth in particular.

Following the 1992 devaluation, the exchange rate was changed from fixed to flexible in order to manage overvaluation via a gradual depreciation of the local currency. However, the rate of depreciation against other foreign currencies rose during the fiscal year 2007/08 compared to prior years. The Ethiopian Birr decreased by 23.7 percent and 16.5 percent against the US dollar in 2009/10 and September 2010/2011, respectively (Zewde, 2018). According to (Zewde, et al, 2018) the currency was devalued by 19.95 percent in September 2010 from the value of 13.63 to 16.35 per US dollar, ostensibly to enhance export performance and bring about fundamental change in the economy. Labata, (2019) reported on October 10, 2017, the currency was devalued by 15%, from 23.4 birr per US dollar to 26.91 birr per US dollar. The combined demands of the World Bank and the IMF have resulted in these devaluations. According to the NBE and the IMF, the goal of these devaluations was to increase exports while decreasing imports, resulting in a better current account balance, strong economic growth, and large foreign exchange reserves.

Table 1- Continuous devaluation and revaluation of Ethiopian Birr per US dollar

Devaluation and revaluation years	Birr/USD	Devaluation & revaluation in %
1945	2.48	
1964	2.50	Devaluated by 0.8%
1971	2.30	Revalued by 8.75 %
1973	2.07	Revalued by 10 %
1992	5	Devaluated by 142 %
2010/11	From 13.63 to 16.35	Devaluated by 19.95 %
2017	From 23.4 to 26.91	Devaluated by 15 %

2.2.2. Causes of Devaluation

Countries devalue their currency for three reasons.

- **To Boost Exports On a world market**

In a global market, exporters have become more competitive. Exports are encouraged while imports are discouraged. When demand for a country's exported commodities rises across the world, the price begins to climb, normalizing the initial effect of the devaluation (Hayes, 2019).

- **To reduce trade deficits**

As per Hayes, (2019) when the value of a country's imports exceeds the value of its exports, currency devaluation will help exports increase and imports decrease. Thus, export products become less expensive and more expensive to import. As a result, the balance of payments improves as exports rise and imports fall, decreasing trade imbalances. Long-term deficits are unsustainable and can lead to catastrophic levels of debt that can destroy an economy. The devaluation of the home currency could aid in the correction of the balance of payments and the reduction of these imbalances.

- **To reduce sovereign debt burdens**

According to Hayes, (2019) if a government has a large amount of government-issued sovereign debt to service on a regular basis, it may be encouraged to support a weak currency policy. If debt payments are fixed, a weaker currency essentially makes these payments less costly over time.

2.2.3. Pros of Devaluation

According to Genye, (2011) currency devaluation has an expansionary impact due to the "expenditure switching and lowering effect." It can help shift demand away from imported items and toward domestically produced goods. Furthermore, when a country's currency is devalued, the price of imported products rises while the price of local goods falls, resulting in an increase in the export of goods. This might contribute to lowering the current trade imbalance and boosting the country's economic competitiveness. In this scenario, devaluation is an essential strategy for increasing aggregate demand in the economy in order to combat unemployment rather than spending too much money on currency revaluation (Zewde, 2018).

Devaluation may also be used to boost growth by alleviating the economy by raising exports and improving the current account, as well as regulating exchange rate overvaluation, which increases imports of products (Genye, 2011).

Devaluation lowers the cost of a country's exports, making them more competitive in the global market, which raises the price of imports. If imports become more expensive, domestic customers are less inclined to buy them, bolstering domestic companies even more. Because the trade deficit decreases as exports grow and imports fall, the balance of payments improves, resulting in a healthier balance of payments. In summary, a country that devalues its currency might lower its deficit because cheaper exports are in more demand (Majeski, 2020).

2.2.4. Cons of Devaluation

Besides its positive effects, currency devaluation can be detrimental to a country that is heavily reliant on the non-tradable industry. The transfer of resources from the exposed sector's profit to the non-exposed sector, as well as the cost of imported products utilized in manufacturing, will not be

proportionate. As a result, the unexposed sectors, as well as total production growth, will suffer (Genye, et al,2011).

As per Genye, (2011) firms exposed to the market can earn greatly from depreciation. However, if there is less rivalry and a favorable environment, this high profit might cause businesses to become inactive, resulting in little change in the long term. According to the transformation hypothesis, when there is strong rivalry, businesses will raise their productivity and become more innovative. A sudden drop in product demand or a rise in production costs result in a poor profit.

As per Ayen (2014), in the long run, currency devaluation has a contractionary effect on Ethiopian output. As a result, whenever currency devaluation is used as a monetary policy in the country, it raises the cost of imported goods and raw materials. Because Ethiopia imports a large portion of its construction inputs from abroad, a considerable rise in the cost of construction inputs caused by the devaluation is a direct impediment to domestic contractors' ability to complete building projects on time. As a result, depreciation hurts both real GDP and the local construction sector in the long run.

The current issue arises when a country lacks the capacity to produce in comparison to imports, in which case the economy suffers from stagnation as a result of the total price increase. According to the author, inflation is another issue that may arise as a result of the devaluation. During such a lengthy period of devaluation, inflation rates raise the price of tradable imported products on the market, as well as the price of locally made goods that require imported intermediate inputs (Zewde, 2018).

2.2.5. Effect of Devaluation

2.2.5.1. Positive Effect of Devaluation

- **Encourage Foreign Investors**

Investors, particularly new investors and those looking to increase their assets have benefited from the currency devaluation versus the dollar. This is particularly visible in the stock market, where shareholders who own the same amount in dollars may acquire a large number of shares listed on the Egyptian stock exchange due to the growth in the value of the dollar. According to the author, this

would have a beneficial impact on the stock market, and those investments will grow (Nagwa M. El Agroudy, 2015). However, Zewde, (2018) argued that in the building sector, promoting foreign investment removes competition from both local and international contractors.

- **Encourage Exporters, Local Material Manufacturers and Providers**

Exporters are among the first to profit from a rise in the dollar's value. The export improves their profits since the purchasing power of the dollar grows when converted into Egyptian pounds, especially if the government is able to contain any inflationary waves caused by raising the currency (Nagwa M. El & Agroudy, 2015). Furthermore, this boost encourages exporters to expand their companies, resulting in greater exports of Egyptian items overseas. As Zewde, (2018) argued, devaluation has a beneficial influence on economic growth for construction businesses that produce in both the domestic and overseas markets. It provides local construction materials and equipment producers and suppliers an advantage in growing and expanding in the local market. When a currency is devalued and translated into the local currency, the amount of profit obtained by a local firm producing in the foreign market increases. In this case, currency devaluation will stimulate the construction sector to expand local investments in materials and construction equipment providers. As a result, these advancements will increase employment and the supply chain in the construction sector.

2.2.5.2 Negative Effect of Devaluation in Construction Projects

Currency devaluation, on the other hand, has a detrimental influence on a country's growth as well as the building industry.

- **Increase in Construction Project Abandonment**

As cited Vendors, (2016) with rising business costs, there will inevitably be significant price changes in building projects, which will have a detrimental impact on prior budgets. As described by the author, this is one of the reasons why many building projects fail and are abandoned. The devaluation of the currency will have an impact on the pricing of previously anticipated budgets for ongoing building projects. If the contractor does not manage this correctly, the project will be abandoned.

- **Reduction in Government Construction Project**

The government is the largest source of building projects, and with the present currency devaluation, the government's capital spending on construction projects will undoubtedly decrease. This will affect all levels of government, from the federal to the state and municipal. As a result, the construction industry's projected contribution to GDP will always decline as fewer building projects are commissioned (Vendors, 2016).

As per MUDC, (2020) due to the currency devaluation of our country over the past four years, lack of foreign exchange, and occasional security crisis, have led to a focus on major projects undertaken to improve inflation in the country, reduce new construction projects, and contractors not being able to complete the projects they have in hand.

- **High Costs of Doing Business**

According to Zewde, (2018) the Ethiopian construction sector is largely reliant on foreign imports for raw materials and building equipment. The cost of acquiring these raw materials and equipment would undoubtedly rise as the naira falls in value. Developers are already feeling the effects of the currency devaluation, since the cost of construction has risen due to the fact that most building supplies are sourced from abroad, such as China, Turkey, and Ukraine (Vendors, 2016).

- **Rise in Interest Rate and Cost of Borrowing**

Due to the capital-demanding character of the projects undertaken by construction firms, there is always the option of obtaining external funding from banks to finance big projects. However, with the recent currency devaluation, the base lending rate is expected to rise, increasing the cost of borrowing cash Vendors, 2016. The rise in the price of products as a result of devaluation may reduce the total amount of money in circulation (real money). Currency devaluation raises interest rates and, in turn, reduces aggregate demand. Domestic companies that rely on bank loans for manufacturing would also be impacted by the interest rate increase. For borrowers and high-indebted countries, an increase in interest rates combined with currency depreciation would exacerbate the issue by increasing the amount owed (Genye, 2011).

- **High Costs of Housing and Properties**

Due to the high cost of doing business, property developers will have to pass on these additional costs to the market in order to remain profitable. The effect of currency devaluation would have been considerably milder if construction materials were produced locally, lowering construction costs and making houses more accessible to the average society (Oyedokun, 2016).

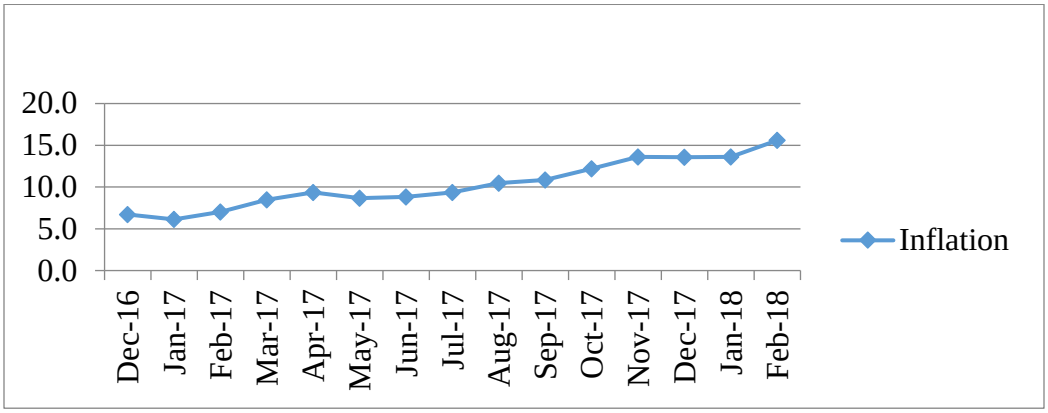
- **Inflationary Impact of Devaluation**

Inherently, currency devaluation causes inflation (Moges, 2004). Inflation is defined as a general increase in the prices of goods and services in an economy over some period of time. According to Moges, (*ibid*), the influence on domestic pricing is communicated both directly through higher import costs (end user products, gasoline, raw materials, and spare parts) and indirectly through increased demand from the tradable sector. As per Zewde, (2018) the inflationary impact of depreciation is complemented and exacerbated by output contraction.

Because of the nature of the process and the rate of return for work done on construction projects, the impact of inflation can lead contractors to lose money and project owners to incur greater costs. Furthermore, owing to the causes that create project delays, the building project would expose the danger of inflationary cost rises (Zewde, 2018).

According to experience from developing countries, exchange rate depreciation is a possible source of inflation in Sierra Leone (Labata, 2019). The author also argued that there is also a strong and significant relationship between currency rate fluctuations and inflation in Uganda.

As per Labata, (2019) inflation is defined as a rise in the total price level of the economy. The government's principal goal is to achieve a stable macroeconomic situation in order to maximize societal welfare. This goal necessitates maintaining a reasonable amount of pricing stability. But the following figure shows that inflation rate in Ethiopia is not stable.



Source: Central statistics agency

Figure 1- Monthly inflation performances in Ethiopia from (Dec 2016 to Feb 2018)

The above figure shows the devaluation of the official exchange rate also added upward pressure on the rate of general inflation in Ethiopia.

- **Low Employment position for Construction Professionals**

With fewer construction projects accessible to contractors as a result of the currency devaluation, the number of available jobs in the construction sector will decrease. Furthermore, in order to remain competitive, construction businesses will cut their labor overhead in an effort to reduce their cost of doing business. Combining these two issues, the employment prospects for qualified individuals within the construction industry will be quite poor. As a result, the economy's unemployment rate will increase (Vendors, 2016).

- **The Rise in Prices and Delayed Implementation of the Projects**

According to Nagwa M. El & Agroudy, (2015) while some experts believe that the decline in the pound's exchange rate will have no effect on domestic price levels during the current period due to the decline in commodity prices globally, businessmen and traders are reporting a sudden increase in some production requirements, which will affect price levels. As a result, the rates of project implementation will be affected. Infrastructure projects, in particular. According to the Egyptian Federation of Construction and Building Contractors, the rise in the dollar rate in banks and the black market has generated a 70 percent increase in the price of products used in projects, particularly imported ores and supplies. Generators, valves, water pumps, and replacement components are examples of such items.

Thus, an increase in the dollar rate has a detrimental impact on the rates of executing and delaying projects.

- **Domination of Major Projects by Foreign Contractors in the Country**

As per Habcon consult (2018), the contract execution practice has favored foreign contractors rather than domestic ones, protecting foreign contractors from any inflation (devaluation risk) and exchange rate fluctuations, as the contract for the main part of the work is designed to operate in a stable currency (such as the US Dollar, Euro etc.). The contract with foreign contractors is typically priced in Birr, similar to the contract with domestic contractors. However, the agreement with foreign contractors includes a condition to effect payment in the foreign currency of their choice by converting the Birr value at a fixed exchange rate that prevails 28 days prior to the bid submission date. As a result, foreign contractors will dominate the sector, forcing domestic contractors to reduce their market share.

The United Contractors Association's (2018) study shows that over the last 25 years, Ethiopia has spent more than 1.3 trillion birr (52 billion birr annually) on infrastructure construction. Thus, it has made a significant contribution to national growth and job creation. The share of local companies in this regard is shown in the table as follows.

Table 2- Involvement of domestic contractors

No	Major works	The project costs /billions of birrs	The role of domestic contractors in%
1	Roads	3	40.1%
2	Energy	4	1%
3	Rail way	2	1.5%
4	Telecommunication	8	1%
5	High-rise buildings	4	6.95%
6	Industry parks	6	3%

Source: Ministry of Urban Development and Construction Works (MUDC)

As per MUDC, (2020) over the past few years, more than 40% of the projects have been implemented by international organizations. Local construction companies and individuals with limited capacity and skills are less involved.

2.2.6. Devaluation vs. Construction Industry of Ethiopia

- **Leads to price escalation in the construction industry**

As per Tarekegn, (2017) if contractual services or other project components are being acquired, the exchange rate is very important. If exchange rates rise above the amount expected by the project sponsor and the firms delivering the services, the project's cost may rise. According to his argument, a study conducted in Nigeria discovered that, approximately 50% of the building materials and components incorporated into construction or parts of the materials ingredients required for the manufacture of the materials are sourced from abroad, bringing to light the issue of foreign exchange and its inherent problems in the construction industry, as well as the need for local sourcing of building materials.

Currency devaluation raises the cost of imported goods and raw materials. According to the Gebregziabher, (2018) report, Ethiopia would import such commodities whether they are expensive or inexpensive, since they are necessary and not a luxury item. Because most building materials are imported, and the country's primary imported materials are construction materials, this has a significant impact on the construction sector (Zewde, 2018). Also, Labata, (2019) found following the currency devaluation of the Birr, Ethiopian imports increased as well. This might be because Ethiopia imports strategic (vital/necessary) goods that are difficult to substitute with local commodities.

After the exchange rate adjustment in October 2017, the reinforcing market was the first to respond. Contractors have temporarily halted work in several areas, while major and small-scale companies have stalled because they can’t function without re-bar. Just one day after the devaluation, the price of re-bar increased sharply, ranging from 12 Br to 86 Br depending on the grade. Following the devaluation, the price of 12m long re-bar with an 8mm thickness has risen to 138 Br (Gebregziabher, 2018). On the other hand, a shortage of supply and increased product prices have caused a lot of problems in the

economy since it plays a vital part in infrastructure development, as well as the destruction of both small and large enterprises and the lives of people who rely on it.

Table 3- Different reinforcement bar price increment prior to devaluation and post devaluation

Diameter	Unit	Sep2017	Oct 2017	May 2018	Oct 2018	Price difference
10	Kg	27.53	29.20	42.54	49	78%
12	Kg	24.76	27.30	49.70	49.71	101%
14	Kg	22.68	26.81	32.67	49.08	116%
16	Kg	24.54	27.07	42.59	49.70	102%
20	Kg	23.53	29.01	42.66	49.06	108%
24	Kg	24.60	31.25	42.60	48.99	99%
28	Kg	24.36	28.01	58.22	58.23	139%
Average price diff						106%

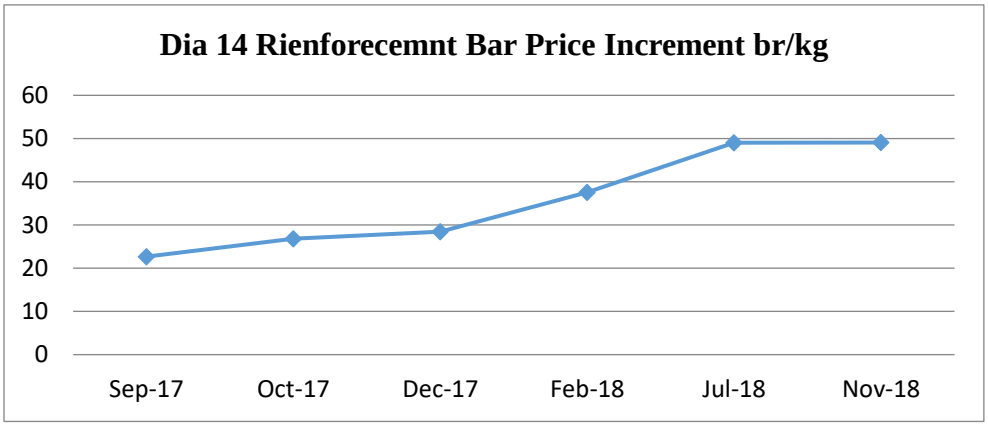


Figure 2- Diameter 14 Reinforcement Bar Price Increment br/kg

The above figure depicts a slight price increase in the market for diameter 14 re-bar from September 2017 to October 2017. Then, with the currency depreciation in October 2017, the price change for the building industry was unrivaled.

Table 4- Average construction materials price prior to devaluation and post devaluation

No	Item	Unit	August 2017	June 2018
1	Nail (7cm - 12cm) (Local)	Kg	37.17Br	97.99 Br
2	Nail with cape/ local	Kg	52.70Br	101.86 Br
3	Coarse aggregate gravel	M3	658.52 Br	689.67 Br
4	Sand	M3	527.04Br	530.82 Br
5	Hollow concrete block (15*20*40) m3	No	8.48 Br	9.83Br
6	Iron Pipe 6mt (1/2 inch) imported	No	278.35 Br	509.90Br

Source: Central Statistics Agency

According to the central statistics agency's assessment of construction materials, the above numbers can be seen before and after the exchange rate, which has led to inflation. The effect of inflation also creates distrust (uncertainty) and risk for construction projects and suppliers who depend on construction projects.

- **Leads to increase inflation rate of construction materials**

If we look at the monthly inflation rate for building materials, it has risen from 2.8 percent in 2016 to over 18.5 percent in 2018. The figure below indicates that there is some correlation between the direction of inflationary fluctuations and the official exchange rate in October 2017.

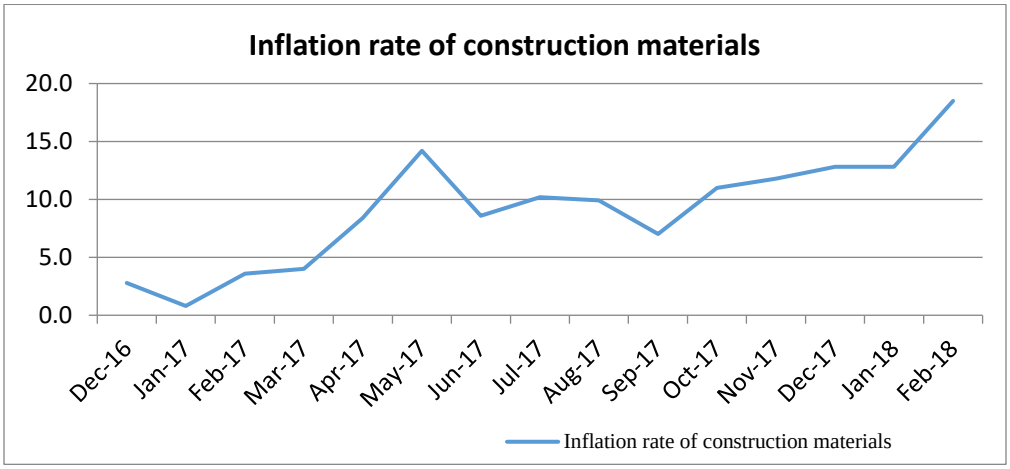


Figure 3- Inflation of construction materials computed from central statistics agency

Consequently, the current birr devaluation has resulted in unanticipated price increases for building materials. Ethiopia's construction business is now confronted with a variety of issues, including rapid currency depreciation followed by inflationary effects, which have generated significant problems in the building industry sector. Local currency devaluation, in addition to increasing inflation, raises customs taxes and Value Added Taxes (VAT), and is about to have a negative impact on the sector in terms of cost overruns, delays in ongoing projects, and overall construction project performance, project abandonment, and so on.

2.3. Construction works Induced by Currency Devaluation

- **Reinforced concrete work**

A major item used in reinforced concrete work includes reinforcement bar, cement, sand, coarse aggregate and form work.

As per Habcon Consult, (2018) Both domestic and imported reinforcement bars are used to meet the country's re-bar requirements. Every year, the government imports a large amount of rebar for use in construction and infrastructure projects. Between 2013 and 2017, the country imported 3.2 million tons of steel/rebar, most of which came from Turkey (42.8%) and China (24.5%). Annually, the country spends around 10 billion birrs on steel materials used in the construction sector.

According to Zewde, (2018) the main cause of the project's poor performance during these periods was the scarcity of rebar that the contractor failed to supply. In the building sector, there was a shortage of reinforcement bars, and the cost of procuring materials was much higher in general. Its consequences have also harmed the contractors. The availability and cost of re-bar have a significant impact on infrastructure project implementation.

The country's cement needs are mostly covered by domestic manufacturing. Dangote, Derba, Mosebo, Muger, National, Habesha, and Ethio Cement are the seven biggest cement factories that make OPC and PPC (Habcon Consult, 2018). The price of cement has been consistent; the average price was Birr 223 per quintal. Following the depreciation of the currency, it increased to 229 birr/qtl, which is a 2% increase. It increased to 250 birr/qtl and remained the same till the last retail price was obtained.

Table 5- Average amount of cement from October 2015 to October 2020

cement	(Oct 2017) Tikmt 2010	(Jan, 2018) Tirr 2010	(Feb 2018) Yekatit 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Aug, 2018) nehase 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2020) Tikimt 2012
average	228.53	228.53	228.25	250.94	250.94	250.94	250.94	250.94	250.94	250.94	250.94	300.00

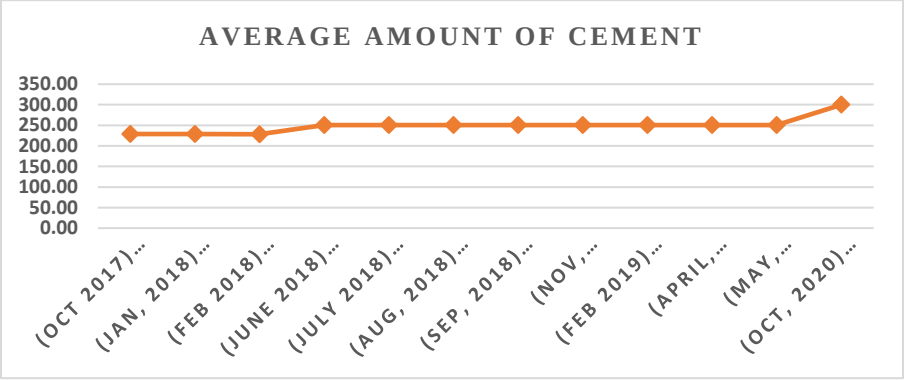


Figure 4- Average amount of cement from Oct 2017 to Oct 2020

2.4. Possible ways of Managing Devaluation

This study attempts to examine Egypt and Mexico currency devaluation issues and measures, and these nations were chosen for three reasons.

1. Based on best practices,
2. Near development consideration
3. Attempts are also made to investigate issues concerning the management of current and future occurrences.

2.4.1. Egypt Devaluation Issues and Measures

The law was enacted on July 9, 2017 to compensate contractors who worked on government projects and were harmed by recent economic legislation (currency devaluation) enacted by the government in 2016. The Prime Minister's Decree published on October 23, 2017 established the percentages based on which the compensation amount for each contract will be computed (EFCBC, 2017).

Contracting and building firms have been confronted by economic challenges such as currency devaluation, increases in customs taxes, and Value Added Taxes (VAT). As a result, firms have asked that the government compensate them for the difference between the price of building materials before the devaluation and their present prices (EFCBC, 2017).

Compensation Criteria

On October 1, 2017, the Prime Minister confirmed the following criteria for providing compensation:

- Contracts benefiting from the law are those made between a private party and a governmental entity or a government-related firm for construction, supply, or service provision.
- The application of the law is restricted to contracts made in whole or in part between the dates of 01/03/2016 and 01/12/2016.
- Contactors, suppliers, and service providers that fail to meet the agreed-upon implementation timetable for reasons ascribed exclusively to them will not profit from the law.

Procedures to Request Compensation

To benefit from the law, an injured party must file a compensation request with the relevant governmental agency, describing the damage caused by the economic law and showing how it disrupted the contract's economic and financial equilibrium. The request must be supported by all supporting

documentation to corroborate the claimed harm. The petitioner must additionally describe the value of the compensation amount from its perspective (EFCBC, 2017).

The governmental entity must evaluate the request, calculate the compensation amount using the specified rates and equations, and create an evaluation report to be sent to the responsible authority for a final decision (EFCBC, 2017).

Each governmental organization is expected to designate a portion of its yearly budget to fulfill its duties under the law and to implement the appropriate processes to guarantee that compensation amounts are paid within 90 days of the injured party's request (EFCBC, 2017).

Who Are the Beneficiaries?

In fact, the new law has set several preliminary requirements for awarding compensation. These are some of the conditions:

- Compensation will be available only for economic legislation-related damages sustained between 1 March 2016 and 31 December 2016.
- As a result of these economic decisions, there is a financial imbalance in construction, supply, and public service contracts.
- Contractors, suppliers, and public service providers who signed contracts with the state, any of its owned enterprises, or any public legal person will be compensated.
- Financial harm happens to the aggrieved party during the contract's execution from 1 March 2016 until the completion of the contract.
- The losses are not caused by the contractor's acts of omission, which cause delays in implementation.

Which Authority Determines the Guidelines?

- The prime minister decree 1677/2017 establishes a committee (the "Supreme Committee for Compensation").
- The Supreme Committee for Compensation shall be empowered to establish the standards and requisite time period for compensation entitlement.

- When it comes to providing compensation, the Cabinet will have the upper hand.
- Such recommendations may serve as a guideline for private-sector contracts.
- The executive rules of the law must be adopted within 30 days following the appointment of the members of the Supreme Committee for Compensation on July 27, 2017.

As per EFCBC, (2017) the new law reflects the government's removal of prior impediments that hampered investors in public projects. Hopefully, this will prevent a cascade of lawsuits against the government in this case.

2.4.2. Mexico currency Devaluation and Measures

According to Puerto, (2014) the Mexican Public Works and Related Services Act provides for pricing adjustments that include contract items based on an index established by the Bank of Mexico. Use cost-reimbursable contracts whenever possible. This form of contract lowers contractors' exposure to inflation and currency volatility. Typically, the contractor's fee is a proportion of the construction cost.

Examine if the country permits terms comparable to Mexico's public works and associated services statute, which enables contracts to be raised or decreased depending on an index. Create and manage an international project database that includes project information such as location, size, year built, inflation rate, currency rate, and local market situation (Puerto, 2014).

2.4.3. Possible ways of Construction Companies to Survive Currency Devaluation

As mentioned in earlier sections, the Ethiopian construction sector imports a significant amount of building supplies, equipment, and machinery for use in the construction industry, and, as a result, they are already feeling the effects of currency depreciation. According to Zewde, (2018) many stakeholders in the building sector are suffering greatly as a result of the devaluation effect. The primary challenges that construction projects are encountering as a result of the current currency devaluation include high inflation, fluctuating market prices, material shortages, and currency shortages. Contractors may not be able to regulate the impact of birr depreciation, but they can control their reaction to it.

Currency devaluation has significantly raised the cost of doing business for construction businesses, resulting in additional financial restrictions. Managing and surviving construction firms have a terrible sense of rising expenses and a shortage of cash (Vendors, 2015).One way or another it needs

- **Practical Cash Management**

According to Vendors, (2015) as a result of the country's currency devaluation, there would be fewer building projects to execute. So, construction companies can't afford to be frivolous with their money during this time. All revenues must be properly handled to ensure that the firm does not run out of operational money while waiting for new projects.

The skill of arranging, managing, and regulating the collection, investment, and disbursement of cash is known as cash management. It is critical in the construction business to monitor a company's overall cash flow as well as the cash flow on significant projects. Acquiring a thorough understanding of this process is critical to successfully managing a construction firm during difficult times. Failure to manage funds prudently can lead to the following outcomes:

- ✓ Increased office costs.
- ✓ Increased capital investment by owners.
- ✓ Credit ratings have deteriorated.
- ✓ Inability to capitalize on fresh opportunities.
- ✓ The company's failure.

The competence as a construction business to handle cash flow sensibly will benefit the company and help it survive in difficult times.

- **Accepting Low-Profit-Margin Projects**

Most construction businesses are known to decline or reject building contracts with low profit margins. Prospective clients will be impacted as a result of less money in circulation in the country as a result of currency devaluation and reduced government spending. The amount of money budgeted for construction projects will be severely limited.

As per Vendors, (2015) accepting building contracts with low profit margins is preferable to being idle in order to remain competitive and secure firms' survival during this naira depreciation currency devaluation phase. Accepting large construction contracts with poor profit margins does not reduce business standards; rather, it raises the profile of the firms for which you have done work.

- **Reducing Workforce**

According to Derso, (2018) the contribution of the construction sector is higher in developing countries such as Ethiopia, and the industry has played a critical role in supporting the country's rapid and equitable socioeconomic growth and transforming the livelihoods of millions of people. This is one of the largest employers of labor. Because of the number of people required to complete construction projects, labor expenses are a significant expense for every construction business. So, as a construction business, reducing your personnel is a guaranteed way to stay afloat (Vendors, 2015).

- **Avoiding Cost Estimation Errors and Budget Overruns**

Cost overruns are an unfortunate fact of life in the construction industry, which is notorious for being late and over budget (Wong, 2019). Price fluctuations or changes in the pricing of building materials required for the project are one of these factors. Because of currency devaluation, the foreign exchange rate is constantly unstable, resulting in price swings. The detrimental impact of these price hikes on the Ethiopian construction sector is visible due to our country's reliance on imports. It should be well-known that up to 70% of all construction materials required in Ethiopia are imported. This includes steel, cables, ceramics, locks, furniture, and electrical fittings. All are critical for the completion of the nation’s superior building and infrastructure goals to be met (ITE Build and Interiors, n.d.).

Fluctuating foreign currency rates are certain to have an impact on the ultimate cost of completing building projects. Finally, if proper precautions are not followed, most construction businesses will be subjected to construction cost estimating mistakes and budget overruns on a regular basis (Vendors, 2015). According to the author, there are three practical actions companies should take as a construction firm to avoid cost estimating errors and budget overruns in order to avoid such a disappointing outcome.

- ✓ **Watch Out for Omissions**

These are either soft costs (permits, fees, etc.) or hard construction expenditures that were inadvertently left out of the estimate. The cost of land development is sometimes substantially greater than anticipated. Also, easy to overlook are finishing touches like bathroom accessories or topsoil and landscaping, as well as fundamental construction materials like fasteners and hardware, window jamb extensions, or home exhaust fan (Vendors, 2015).

Omissions may occur as a result of elements missing from the designs and specifications that were not included in the estimate and bid. A solid checklist, as well as precise drawings and specifications, are the finest tools for avoiding omissions. If components are not included in the plans and specifications, the bids you get will most likely exclude them as well (Vendors, 2015).

- ✓ **Avoid Wrong Assumptions**

This is a broad and possibly costly category that must be avoided with caution Vendors, (2015). They are goods that you believed would be covered by a bid but were not. If you find yourself saying, But I thought it was included in the price, you've had firsthand experience with this. These issues are typically caused by a lack of clear communication of expectations via plans, specs, and work descriptions (scope of work) in the contract.

Communication skills are essential in nearly every profession, but especially in construction management. Working with several stakeholders at the same time necessitates a construction manager's ability to communicate clearly, practically, and concisely, which is one of the most important construction management abilities (Vendors, 2015).

So, the best way to avoid these errors is to include clear communication in the plans, specifications, and contract, so that all parties are aware of what is anticipated.

- ✓ **Price Changes**

Material, equipment, and labor expenses may increase between the estimate and the project. Before committing to an estimate, always check material pricing and negotiate with suppliers to lock in rates for the project.

Schedule the rental equipment in an effective manner based on equipment expenses to avoid wasting money. Allowing rented tools and equipment to remain on a project if they are not being used is not acceptable. If the equipment is needed later in the project, consider the expense of storing it versus paying for pickup and delivery (Vendors, 2015).

- ➢ **Outsourcing of Jobs**

Whether the company specializes in building materials, construction equipment, or commercial interiors, efficient personnel acquisition is critical since unfilled jobs frequently cause delays and cost overruns. However, not all skills should be employed full-time because some occupations have a greater comparative advantage if they are outsourced rather than kept in-house (Vendors, 2015).

Similarly, Vendors, (2015) argued certain duties are project-specific, which means they are rarely required until a building project is granted. Such activities are considered direct overhead expenditures, and outsourcing them on a per-project basis can significantly improve firms' cash flow.

As a result, hiring such specialists through outsourcing is less expensive than keeping and sustaining them in-house. These activities save money and clear the backlog of capital expenditures associated with office and staff maintenance. The following are some examples of building jobs that can be outsourced:

- Architect
- Quantity Surveyor
- Geotechnical Engineer
- Legal Services
- Information Technology
- Accounting
- Planning Engineer

- Civil/structural Engineer

➢ Reduction in Overhead Cost

Overhead costs can accumulate rapidly in any business, especially in construction. Overhead costs are the continuing costs associated with running a business. But Construction overhead costs greatly deplete the cash flow of many construction companies during currency devaluation, so reducing them helps to free up the operating costs. Here are some ways to check overhead costs; (Vendors, 2015). Reduce administrative costs such as wages and benefits for top executives, employees, and other people.

- cross-train employees to get the best out of each worker.
- Reduced indirect costs such as marketing and advertising, legal fees, charity donations, and other contractual professional services such as auditors, etc.
- Rethink the necessity of company-owned automobiles.
- leasing or selling underutilized equipment.
- Reduced office expenditures such as office rentals or leases, as well as other basic expenses like supplies, utilities, phone bills, office equipment and furnishings, and so on.
- Outsource your information technology, accounting, and administrative activities.

2.5. CONTEXTUAL LITERATURE REVIEW

2.5.1. Legal Basis for Reimbursing Contractors for the Effects of Devaluation

The legal foundation for the contractor to pay compensation for the effect of government policy devaluation is detailed below.

Article 1767: Contracts made with a Public Administration

(1) The court may vary a contract made with a public administration where the circumstances in which it was made have changed through an official decision in consequence of which the obligations assumed by the party who contracted with the administration have become more onerous or impossible (Negarit Gazeta, 1960).

Article 3186: Provisions for the, variation or revision of prices

The existence in the contract of a provision relating to the variation or revision of prices shall not prevent compensation being due where:

(A) Such provision has not been enforced; or

(B) It appears that the enforcement of such provision is not sufficient to remedy the effects of the economic upsetting of the contract, as in the case where there are fluctuations affecting elements other than those which have been chosen as an index in the variation clauses (Negarit Gazeta, 1960).

Article 3190: general measures. 1. Affecting substance of contract

(1) Laws, regulations, orders and other measures of general application, made by the public authorities, which directly modify the provisions of the contract or prevent the enforcement of some provisions of the contract shall enable the party having contracted with the administrative authorities to claim compensation.

(2) Such compensation may not be refused unless the measure of general application has specified that no compensation shall be paid (Negarit Gazeta, 1960).

As per Habcon Consult, (2018) in addition to the predictable rate of material price growth, Public Procurement and Property Administration Proclamation No. 649/2009 has underlined the necessity for price adjustment provisions in bidding papers, and it has explicitly specified the following:

Price adjustments which may be made during contract implementation, as well as the criteria and method in which such price adjustments may be made for special procurements as stipulated by the Minister.

In accordance with the above provision of the proclamation, the public procurement directive has regarded contracts with a contract time of more than 18 months as eligible for adjustment of normal price change during contract implementation. After 12 months from the effective date of the contract, price adjustments are permitted in respect of work contracts. In accordance with article 16.14.2, price adjustment for work contracts, the method of price adjustment is required to be determined on the basis

of the formula by applying the price index or indicator applicable at the time of submission of such request.

Despite the foregoing requirements, procurement entities' execution of the price adjustment provision is sporadic and ineffective. Most purchasing organizations in the construction sector examine only price changes for certain materials, such as reinforcing bar, cement, asphalt, and petrol, while ignoring price changes for construction equipment and labor. In addition, some procuring bodies completely ban price adjustments, notwithstanding the rules of the public procurement proclamation and directive (Habcon Consult, 2018).

According to MUDC, (2020) when we look at these situations in accordance with the law of our country, we look at three aspects of the law (government interference, unforeseen circumstances, and breach of contract);

- civil Code 3192 (2) and 3193 make it clear that government interference is unacceptable.

Article 3192: Particular measures.1. Taken by contracting authorities.

No compensation shall however be due where the measure taken is merely the ascertainment of the inevitable consequence of economic facto extraneous to the parties (Negarit Gazeta, 1960).

Article 3193. 2. Taken by another authority.

(a) : No compensation shall be due where the act which is the cause of the damage emanates from an authority other than that which has concluded the contract.

(b) : In such cases, nothing shall affect the rules relating to unforeseen circumstances or to the responsibility of public authority (Negarit Gazeta, 1960).

- According to Civil Code 3184 and 3185 (3), construction companies are unable to provide evidence that the contract has exceeded their contractual obligations and that the circumstances are unpredictable.

Article 3184: Upsetting of contract.

the balance of the contract shall be deemed to be upset where new circumstances impose on the partycontracting with administrative authorities' additional obligations which certainty surpass the extremelimits which could be expected by the parties on the making of the contract (Negarit Gazeta, 1960).

Article 3185: Unforeseeable events.

the tact that an event was not foreseen may be invoked by reason of events which had alreadyhappened on the making of the contract (Negarit Gazeta, 1960).

On the other hand, if these conditions are not addressed immediately, the industry could have the negative impact listed below.

- Most projects run the risk of interruption.
- The level of industrialization at the national level and its contribution to national development will be greatly reduced.
- It will have a negative impact on the development of our country
- The country's projects are not being spent on time as planned.
- Construction companies are not able to repay their loans, as well as their suppliers and employees. In addition,
- It is important for the government to solve this problem now and the more it is delayed, themore it will cost our country.

2.6. Research Gap Identified

Very limited studies exist on the depreciation of the currency, its impact on the Ethiopian economy and currency devaluation on developing countries has been observed. However, the impact of currency devaluation on contractors as well as contributory trade work induced by devaluation has not been well studied. In addition, there has been no clear study conducted previously regarding minimizing the effect of devaluation on contractors.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

After discussing different issues in the literature review in relation to the effect of devaluation on contractors as well as the construction industry, the review also used different countries' approach on currency devaluation issues and measures the way how they will be minimized for current and future occurrences. Following the literature review, the research methodology explains the several processes that the researcher used when studying the research questions in order to address the research problem methodically and make the research useful. This chapter will go through the research paradigm, research type, approach, methodology, data gathering techniques, and how to analyze them will be discussed.

3.2. Research Design

This study used secondary data analysis methods, including desk study, taking a sample project based on criteria to show the effect of currency devaluation, and contributory trade of works. Contract Documents, construction material prices from pre and post devaluation period and other relevant data is depleted to analyze the impact of the devaluation on the selected public building construction projects. The data obtained is presented in tables and also in graphs for proper pictorial explication. The Desk study concentrated on gathering and examining contractual documents and the average list of construction materials from the central statistics agency and the national construction magazine. Contractual documents, BOQ and material work breakdown is expended to determine the price adjustment factor for the exact purpose of the currency devaluation effect on selected public buildings and to understand the contributory trade of works induced by currency devaluation. And finally, methods to minimize the effect for current and future occurrences is discussed.

3.3. Research Philosophy

3.3.1 Post positivism

This study tries to explain how the effect of devaluation will be minimized on contractors and it tries to understand or identify the most contributory trade of works due to devaluation. In order to get more

accurate results, the research is conducted based on the data found in already existing natural settings and needs the researcher's contribution to organize them.

3.4. Research Type

This study uses inductive theory building to construct a theory from data declaring the effect of currency devaluation on domestic contractors, explaining how the effect of devaluation can be minimized for current situation and future occurrences, and generating a general concept that helps to minimize the impact by discussing automatic preventive methods for the success of projects to finish based on schedule and helps to build domestic contractors' capacity and making them competitive in the construction industry.

3.4.1. Based on application

This study focuses on advancing scientific knowledge for the complete understanding of minimizing the effect of currency devaluation on contractors, a case study on selected public building projects. Knowledge is obtained for the sake of knowledge and is conducted for academic purposes.

3.5. Research Objective

3.5.1. Explanatory

The objective of the research is to clarify how the effect of currency devaluation can be minimized by considering other countries' perspectives on currency devaluation issues and measures, which helps to finish projects as scheduled and benefit contractors adversely affected by the government measure. In addition, advancing knowledge to aware stakeholders involved in the construction industry.

3.6. Research Approach

The research used a quantitative with less qualitative approach to address the research questions. The data for the study is obtained mainly from secondary sources. The prices of construction materials were collected from the central statistics agency (CSA), national construction magazine published journals, while the contract documents and bill of quantity (BOQ) were collected from case projects. The

researcher follows an explanatory, quantitative with less qualitative method of research design to investigate how the effect of currency devaluation will be minimized.

3.7. Source of Data

This study used secondary data to gather essential information concerning the effect of currency devaluation on contractors and to understand the contributory trade of works induced by currency devaluation. The source of the data for this study has been selected from public building projects in which contracts were signed before and after currency devaluation, the national construction magazine and the central statistics agency. This source delivers contract documents and construction materials price lists for the pre and post devaluation period. The particular reason for the circumstances is data reliability, and it tries to show the exact impact of currency devaluation.

3.8. Research Methodology

3.8.1 Case Study

Yin, (2014) wrote case studies show details of limited events or situations and their interactions that serve a real purpose and objective. Yin (*ibid*) also argued that a case study research methodology is preferred when the research questions are more explanatory involving. Consequently, case study methodology is chosen to explore the effects of devaluation on the building projects after the arrangement of currency devaluation, and it also emphasized contributory trade of works due to currency devaluation by taking public building projects thru pre and post devaluation period.

3.9. Data Source Size

The concept of data saturation was used to determine the appropriate data size. This study used multiple case studies as a data source to allow the researcher to have deep knowledge and to construct the overall study stronger. Purposively, projects which were signed and started their progress before currency devaluation helps to investigate the effects of currency devaluation. Similarly, projects which were signed before and after currency devaluation is incorporated to identify contributory trade of works induced by currency devaluation.

3.10. Data Collection Method

3.10.1. Document review

According to Yin, (2014) the documents are primary data sources for case studies. Yin, (*ibid*) also explains document review instruments for data collection are stable, can be seen frequently and at any time, and were not developed as a result of the case study, so they include accurate information about the events that occurred during the product process groups.

The researcher collects data through document review of case projects, which includes contractual documents, construction materials price from national construction magazines, and the central statistics agency. And literature has been reviewed from reports, journals, books, websites etc.

3.10.2. Desk Study

Desk study is the act of evaluating information and data related to a certain study before embarking on a new or more comprehensive investigation, knowing what the researcher is searching for. As a result, the desk study was chosen as a method for assessing the experience of linked research, reports, and publications. It is used to collect secondary data from internal sources, including contract documents.

3.11. Data Source Selection /Sampling technique

Etikan, Musa, & Alkassim, (2015) stated that in purposive sampling the researcher has something in mind and cases to suit the purpose of the study and each case will provide unique and rich information.

On this study, to understand the impact of devaluation and to identify contributory trade induced by currency devaluation, a maximum variation purposive sampling (Heterogeneous sampling) is used. And the sample size it determined by data saturation and not by numerical power analysis is used. The selection criteria for sample case building construction projects are stated below.

- Public building projects in which the contracts were signed prior to the 2017 currency devaluation period has been selected. Four building projects have been selected From Federal Government Building Projects and Ethiopian Construction Design & Supervision Works

Corporation Building and Urban Design & Supervision Works Sector. These projects were started in different times and found in different construction phases.

- Public building projects pre and post devaluation period was chosen to demonstrate the contributory trade of works influenced by currency devaluation. Ten building projects have been selected From Federal Government Building Projects and Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector.
- Only domestic contractors were incorporated in this research since they are the first more exposed to the impact of devaluation, and this gives a good understanding of the effects devaluation.

3.12. Data Analysis

The price of construction materials was gathered from the central statistics agency and the national construction magazine. The national construction magazine publishes the price of construction materials on a monthly basis. Besides, document review was analyzed from selected public building projects. From these sources, the researcher has been compiled monthly price data; the data from contract documents was collected and evaluated to weigh the effect of devaluation on the price of construction materials and to investigate contributory trade due to currency devaluation. The data analysis uses simple averages, percentages, tables and charts. Based on the results of the analysis, conclusions and recommendations will be made.

3.13. Methods to Determine the Quality of Research

The two most significant ideas utilized to assure research quality are research reliability and validity Kirk & Miller, (1986). The term "reliability" refers to the capacity of a research approach to deliver consistent results under the same conditions. To ensure reliability, the approaches and methods (data collection, analysis, case selection etc.) were clearly presented and justified.

The construct validity of a research instrument refers to its ability to measure what it claims to assess. It clarifies the researches tool accuracy. Yin, (2014) argued that case study researchers need to

guarantee construct validity through the triangulation of multiple sources of evidence. This study tried to triangulate the data by using multiple data sources.

The extent to which study findings can be repeated or applied to different research settings is referred to as external validity. Thus, this study uses purposive sampling, which allows the researcher to select sample case projects that can contribute and helps to achieve the objective of the study. This ensures collecting data that exactly shows the effect of currency devaluation and its contributory work.
Internal validity, on the other hand, assesses how well the study supports assumptions about causation and effect. Internal validity of this study was improved through explanation building to guide the discussion of the analysis. To guide the research, other countries' devaluation issues and measures have been devised.

3.14 Summarized Study Frame Work

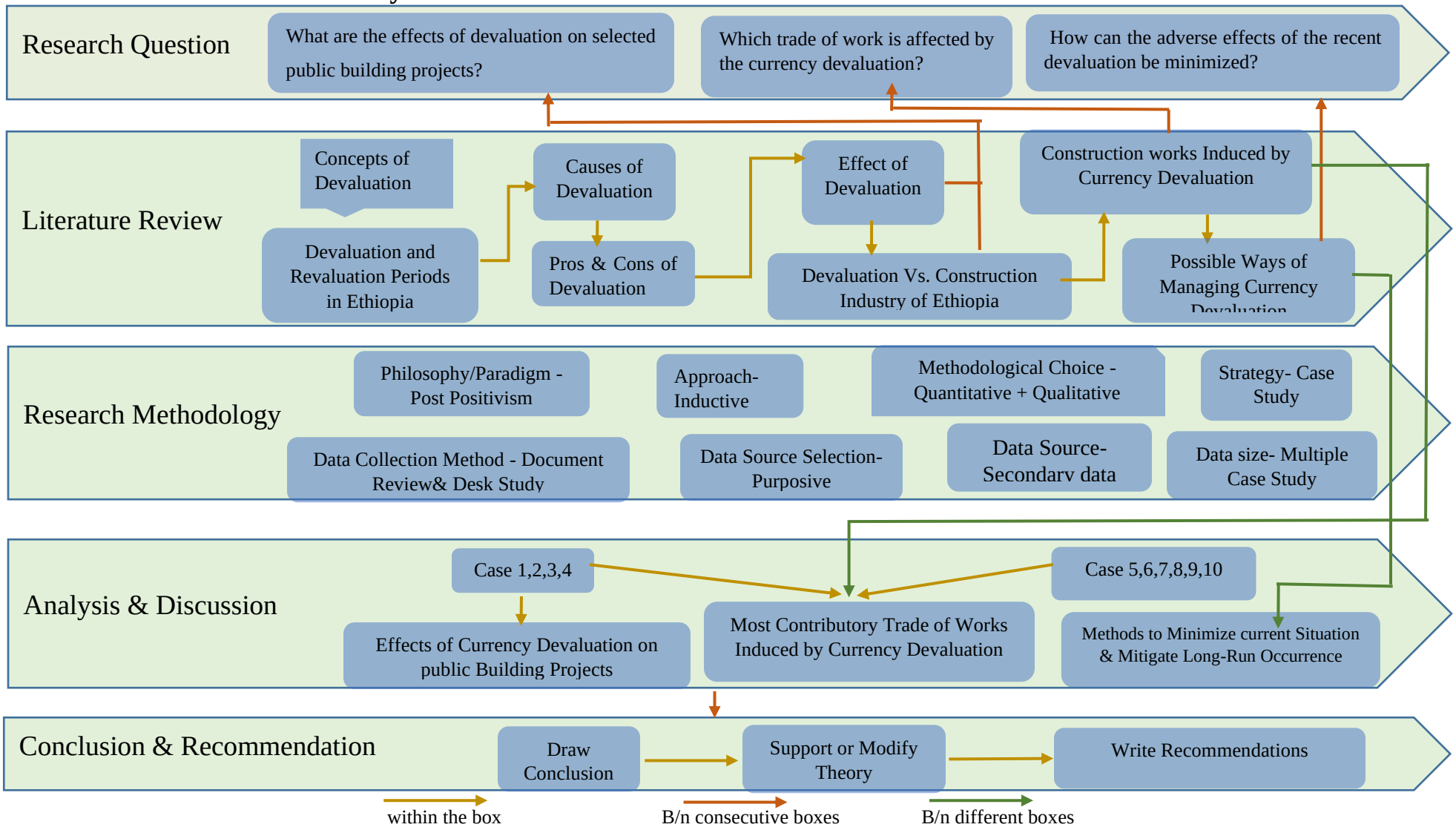


Figure 5- Summarized study frame work

Chapter three has presented the methodology for collection of data for this study. Chapter four presents analysis and discussion (findings) and Chapter five presents conclusion and recommendation

CHAPTER FOUR: ANALYSIS AND DISCUSSION

4.1. General Description

This section covers analysis and discussion of a case study on selected public building projects in Addis Ababa which will convert all the data and information on the particular project to show the exact effect of currency devaluation on construction projects and to identify contributory trade of works.

Three inquiries have been developed to answer the questions being studied. The data was obtained from selected ten (10) public building construction projects in Addis Ababa which were constructed and supervised by different contractors and consultants and had project costs of more than 124 million birr, including contract documents, construction materials prices from national construction magazines, and the central statistics agency. The study uses a price adjustment formula to determine the adjustment factor, price of construction materials, weighting factor, simple average, and percentage to analyze the data. Along with the line, tables and charts will be utilized for ease of understanding. Finally, there will be a discussion on minimizing the effect of currency devaluation to protect domestic contractors from risks that arise as a result of devaluation.

Table 6- Project Description

No	Project Name	Contract Signed date	Project duration	Project cost	Project status
1	Federal police commission project	17-May 2016	2 years	124,892,786.39	Under construction (finishing)
2	4B+G+16 Government Communication affairs Office complex	12-Aug2016	2 years	1,176,066,708.98	Completed
3	School of Journalism and Mass Communication Project	18-May 2017	2.5 years	813,827,805.95	Under construction
4	Construction of Office Building Work (Geophysics)	18-May 2017	1 year	217,068,248.14	Under construction
5	Apartment and office building for Ministry of Foreign affairs	12-Jan 2018	2.5 years	1,135,490,490.91	Completed
6	Ethiopian civil aviation authority head quarter building	20- Dec 2018	2 years	292,566,405.69	Completed
7	New professional theater building	6- Mar 2019	1.5 years	1,496,919.095.48	Completed
8	Construction of national meteorology agency building Lot 1	13-Feb 2020	1year	696,469,302.44	Under construction
9	Construction of federal documents authentication and registration head quarter office building	Sep 2020	1.5 years	1,649,471,613.86	Under construction
10	Construction of national meteorology agency building Lot 2	17-Sep 2020	1year	391,684,569.89	Under construction

4.2. Effect of Currency Devaluation on Public Building Projects

this section will attempt to show the effect of currency devaluation on a given project by using construction materials' monthly price changes and price adjustment formulas to calculate the material price escalation of a given project. This section covers four public building projects where contracts were awarded before the currency devaluation arrangement. Major construction projects such as concrete work, electrical installation, finishing work, aluminum work, plastering and pointing, masonry work, and structural steel work will be used to demonstrate the impact of the currency devaluation that occurred in October 2017.Thus, inflation can be calculated for materials, labor, fuel, and equipment in line with the following formula.

$$PN = NV + A\frac{Mn}{Mo} + B\frac{Ln}{Lo} + C\frac{Fn}{Fo} + D\frac{En}{Eo} \text{ etc.}$$

In this case the price adjustment formula for material element will be calculated by

$$PN = NV + C\frac{Cn}{Co} + R\frac{Rn}{Ro}$$

Where:

NV is non-variable, that is, a non-adjustable portion of the contract amount, particularly the category of the work

C and R are weightings or coefficients representing the estimated proportion of each material cost element of material, respectively, in the category of Works thereof,
Cn and Rn are the current or recent cost indices prices of the cost elements of material

Co and Ro are similarly the base cost indices or reference prices corresponding to the above cost elements at the bid closing date.

Where: NV +C+R is equal to 1.

Source: contract agreement for the construction of the school of journalism & mass communication building

4.2.1. Case study one: school of Journalism and Mass Communication Project

Table 7- Project description for case 1

Project:			School of Journalism and Mass Communication Project	
Employer:			Addis Ababa University	
Consultant:			Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector	
Contractor:			SATCON Construction Plc.	
Date of Signing of The Contract			18-May 2017	
Original Contract Amount including VAT (A)			813,827,805.95	
Original Contract Amount excluding VAT (B)=[(A)]/1.15			707,676,353.00	
No.	**Description of Works**	**Contract Amount [E]**	**Weighting Factor (F)=[(E)/(B)]**	**Weighting Factor (D)=[(F)] *%**
1	Concrete Work	230,445,057.00	0.33	32.56%
2	Electrical Installation	102,826,225.00	0.15	14.53%
3	Floor and Wall Finishing	81,089,828.00	0.11	11.46%
4	Aluminum Work	68,177,888.00	0.10	9.63%
5	Plaster & pointing	61,140,516.00	0.09	8.64%
6	Masonry & Block works	19,932,673	0.03	2.82%

4.2.1.1. Concrete work

From October 2017 onwards, inflation can be shown in the concrete work price adjustment formula Pn= [0.34+0.15*(Cn/Co) +0.51(Rn/Ro)] using cement and steel price changes. The cement and rebar

prices utilized in this computation are detailed in Annex 2 and 3. Annex 9 describes adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from the journalism and mass communication project.

Table 8- Inflation of concrete work for case 1

	pn= 0.34+0.15(Cn/Co) +0.51(Rn/Ro)						Cn- New Cement Price Co- Old Cement Price			Rn - New Rebar Price Ro - Old Rebar Price	
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.52	1.50	1.49	1.43	1.42	1.36	1.38	1.46	1.37	1.32

Accordingly, the concrete work showed an average increase of 1.39or 39% the last year.

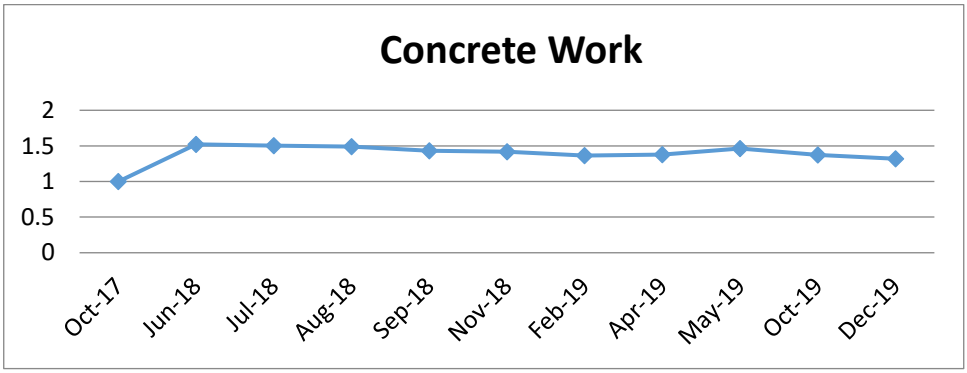


Figure 6- Monthly inflation of concrete work for case 1

4.2.1.2.Electrical Installation

From October 2017 onwards, inflation can be shown in the electrical installation price adjustment formula Pn= 0.9491+0.0509 (En/Eo)] using switch and socket price changes. The average price of switch and socket used for this section is described in annex 4.

Table 9- Inflation of electrical installation for case 1

pn= 0.949+0.0509 (En/Eo)				New switch &socket price Old switch &socket price	
	M1	M2	M3	M4	M5
Time	Oct-17	Jul-18	Sep-18	Apr-19	May-19
Pn	1.00	1.01	1.00	0.99	0.99

Accordingly, the electrical work shows an average of 0.99 the last year or didn't show an increase. This calculation has not been able to show the actual inflation due to lack of operational data (information).

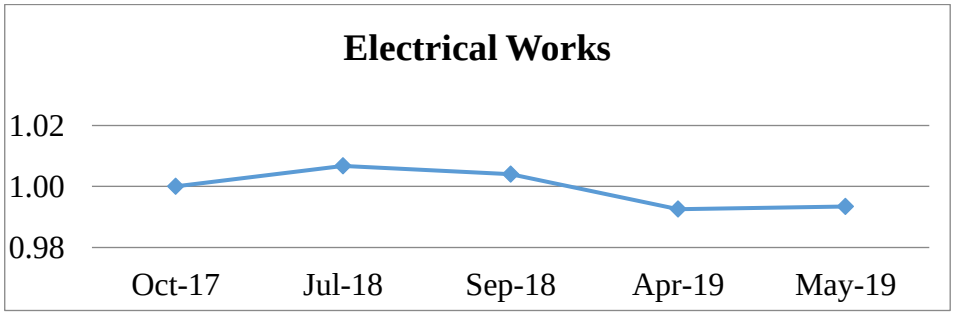


Figure 7- Monthly inflation of Electrical work for case 1

4.2.1.3.Finishing work

From October 2017 onwards, inflation can be shown in the finishing work inflation formula Pn= [0.6362+0.3523*(GTn/GTo) +0.0115 (Cn/Co)] using Granite Tile and Cement changes. The table in annex 6 & 2summarizes the average price of granite tile and price of cement used for this section. Annex 10 describes adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from the journalism and mass communication project.

Table 10- Inflation of Granite tile for case 1

pn= 0.6362+0.3523(GTn/GTo) +0.0115(Cn/Co)			New Granite tile price / Old Granite tile price		New Cement price / Old Cement price	
	M1	M2	M3	M4	M5	M6
Time	Oct-17	Jun-18	Jul-18	Sep-18	Oct-19	Dec-19
Pn	1	1.02	1.06	1.04	1.13	1.13

Accordingly, the finishing work showed an average increase of 1.633 or 6.33% the last year.

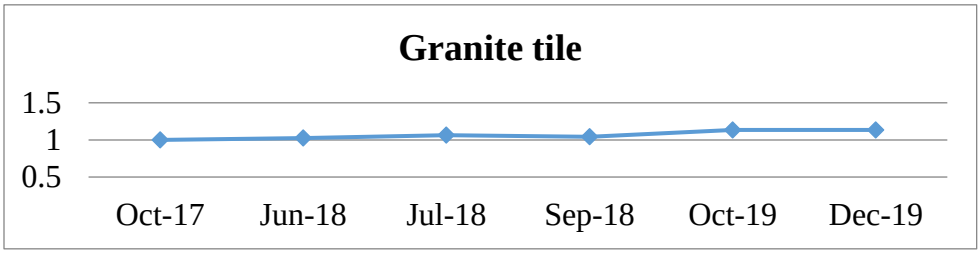


Figure 8-Monthly inflation of granite tile for case 1

4.2.1.4.Aluminum Work

From October 2017 onwards, inflation can be shown in the aluminum work inflation formula Pn= [0.4588+0.5412* (An/Ao) by using aluminum price changes. Annex 8 details the cost of aluminum windows. Annex 10 describes adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from the journalism and mass communication project.

Table 11- Inflation of aluminum work for case 1

				Pn=0.4588+0.5412(An/Ao)				An- New Aluminum window Price							
								Ao- Old Aluminum window Price							
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Time	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Oct-18	Nov-18	Dec-18	Nov-19
Pn	1	1	1	1	1	1	1.0601	1.060133	1.0601	1.06013	1.06013333	1.0601	1.0601	1.06013	1.06013

Accordingly, the aluminum work showed an average increase of 1.04 or 4% the last year.

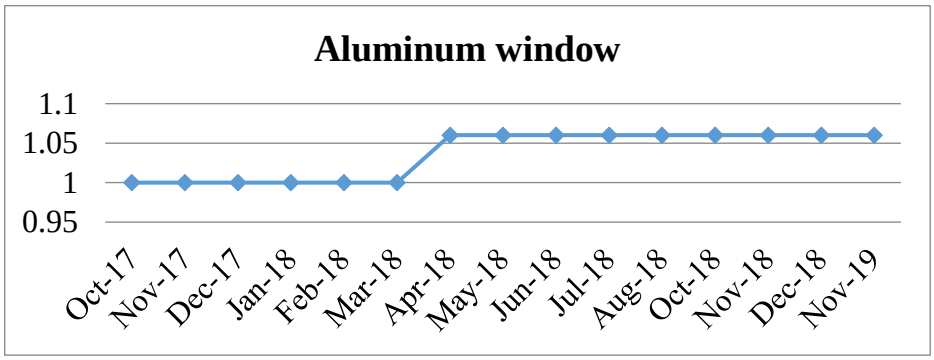


Figure 9 - Monthly inflation of aluminum work for case 1

4.2.1.5.Structural steel work

From October 2017 onwards, inflation can be shown in the structural steel work inflation formula Pn= 0.3288+0.6712* (Rn/Ro) by using rectangular hollow section price changes. The price of rectangular hollow section is described in annex 7. Annex 10 includes summaries of adjustable contract items from the journalism and mass communication project, along with adjustable and non-adjustable contract items.

Table 12 - Inflation of structural steel work for case 1

pn= 0.3288+0.6712 *(Rn/Ro)									Rn- New RHS Price Ro- Old RHS Price			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Time	Oct-17	Jan-18	Feb-18	Jun-18	Jul-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.2	1.3578	1.2864	1.315	1.32291	1.3098	1.3395	1.298	1.3194	1.3398	1.3229

Accordingly, the structural steel work showed an average increase of 1.28 or 28% the last year.

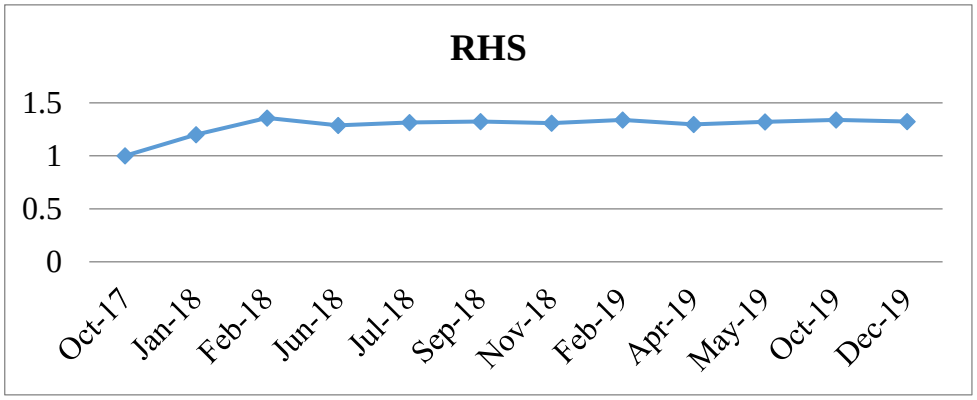


Figure 10- Monthly inflation of structural steel work for case 1

4.2.1.6.Plastering work

From October 2017 onwards, inflation can be shown in the plastering work inflation formula Pn= 0.84+0.16* (Pn/Po) by using cement price changes. The cost of cement is detailed in annex2.Annex 9 describes summaries of adjustable contract items from the journalism and mass communication project, along with adjustable and non-adjustable contract items.

Table 13- Inflation of plastering work for case 1

Pn=0.84+0.16(Cn/Co)								Cn- New Cement Price Co- Old Cement Price			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02

Accordingly, the plastering work showed an average increase of 1.02 or 2% the last year.

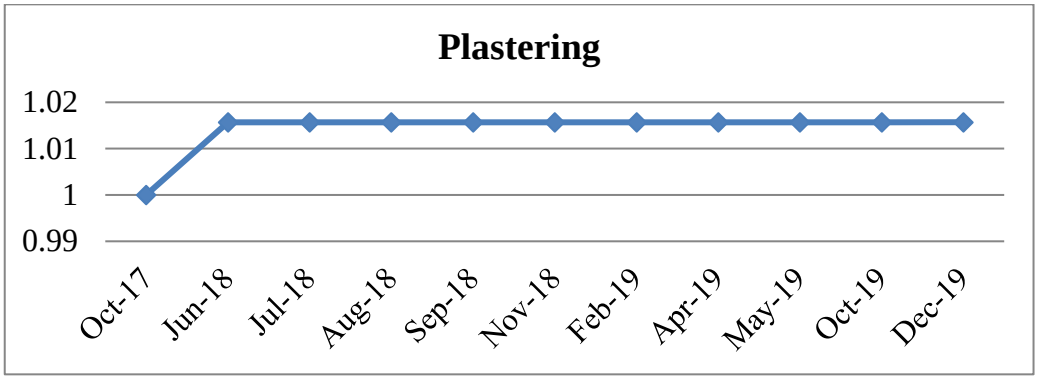


Figure 11 -Monthly inflation of plastering work for case 1

4.2.1.7.Masonry& Block work

From October 2017 onwards, inflation can be shown in the masonry& block work inflation formula Pn= 0.93+0.07* (Cn/Co) by using cement price changes. The cement price utilized in this computation is detailed in Annex 2. Summaries of adjustable contract items from the journalism and mass communication project, along with adjustable and non-adjustable contract items are described in annex 9.

Table 14-Inflation of masonry & block work for case 1

Pn= 0.93+0.07*(Cn/Co)								Cn- New Cement Price Co- Old Cement Price			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01

Accordingly, the masonry & block work showed an average increase of 1.01 or 1% the last year.

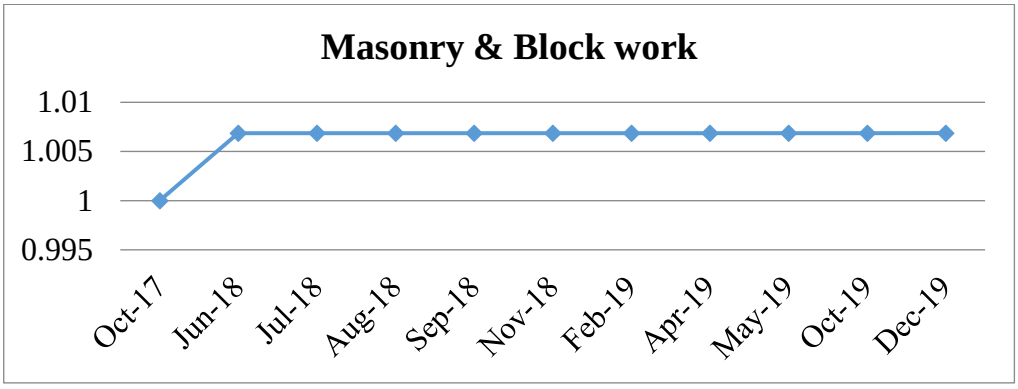


Figure 12- Monthly inflation of masonry &block work for case 1

As we can see from the above, it is possible to know the effect of inflation on this project by multiplying the value of the above with the share of the work for a building project. Accordingly, it is possible to estimate the largest share of the work, such as concrete 32%, masonry and block work 4.09%, steel and metal work 9.76%, finishing works 15.10% and electrical works 19%. By multiplying by the amount of inflation that occurs, the percentage of total pressure can be estimated. See annex 17 Percentage share of components in different buildings.

The following table shows the overall effect of the price increment on the total project cost/original contract price for school of journalism and mass communication project.

Table 15- The percentage of total pressure anticipated for case1

Trade of works	**% Cost**	**PA**	**Average material price increase**
Excavation and earth work	4.67		
Concrete works	32	0.39	12.48
Masonry & Block works	4.09	0.01	0.0409
Roofing and Water Proofing	3		
Carpentry &Joinery	4		
Steel &Metal works	9.76	0.28	2.7321

Finishing works	15.10	0.0833	1.2574135
Painting	2.125		
Glazing	1.42		
Sanitary works	4.85		
Electrical works	19	0	0
Total	100		16.51

To sum up everything that has been stated so far, the above case study shows a 16.51% price increment on selected major work items due to currency devaluation.

4.2.2 Case study two: Federal police commission project

Table 16– Project description for case 2

Project:		Federal Police Commission Project		
Employer:		Federal Police Commission		
Consultant:		Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector		
Contractor:		FE Construction PLC.		
Contract signing date		17-May-16		
Original Contract Amount including VAT (A)		124,892,786.39		
Original Contract Amount excluding VAT (B)=[(A)]/1.15		108,602,422.95		
I. No.	**Description of Works**	**Contract Amount (E)**	**Weighting Factor (F)=[(E)/(B)]**	**Weighting Factor (D)=[(F)] *%**
1	Concrete Work	29,534,525.00	0.27	27.20%
2	Electrical Installation	27,621,165.00	0.25	25.43%

3	Floor and Wall Finishing	10,604,130	0.10	9.76%
4	Aluminum Work	10,237,313.60	0.09	9.43%
5	Masonry &Block Work	7,222,350	0.07	6.65%
6	Plastering Work	5,415,390.00	0.05	4.99%

4.2.2.1.Concrete work

From October 2017 onwards, inflation can be shown in the concrete work price adjustment formula Pn= [0.2861+0.1568* (Cn/Co) +0.5571 (Rn/Ro)] using cement and steel price changes. The cement and rebar prices utilized in this computation are detailed in Annex 2 and 3. Annex 11 describes adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from the federal police commission project.

Table 17- Inflation of concrete work for case 2

Pn=0.2861+0.1568*(Cn/Co) +0.5571*(Rn/Ro)					Cn- New Cement Price Co- Old Cement Price			Rn - New Rebar Price Ro - Old Rebar Price			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.57	1.55	1.54	1.47	1.45	1.40	1.41	1.51	1.41	1.35

Accordingly, the concrete work showed an average increase of 1.42 or 42% the last year.

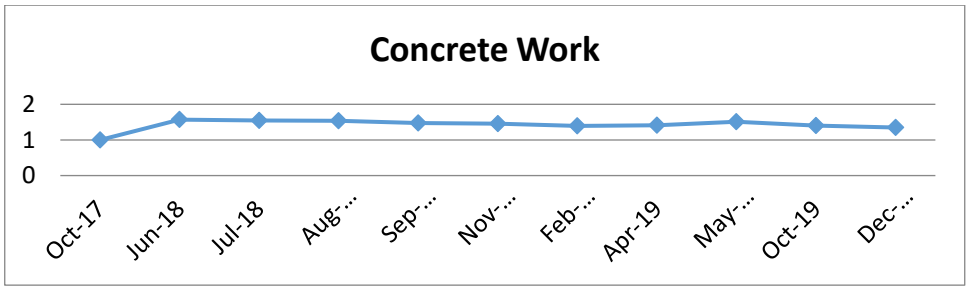


Figure 13-Monthly inflation of concrete work for case 2

4.2.2.2.Electrical Installation

From October 2017 onwards, inflation can be shown in the electrical installation price adjustment formula Pn= 0.97+0.03 (En/Eo)] using switch and socket price changes. Annex 4 describes the average price of the switch and socket utilized in this part.

Table 18- Inflation of electrical installation for case 2

Pn=0.97+0.03(En/Eo)			New socket & switch price		
			Old socket & switch price		
	M1	M2	M3	M4	M5
Time	Oct-17	Jul-18	Sep-18	Apr-19	May-19
Pn	1.00	1.003972	1.002404	0.99561	0.996132

Accordingly, the electrical work shows an average of 0.996 in the last year or didn't show an increase. This calculation has not been able to show the actual inflation due to lack of operational data (information).

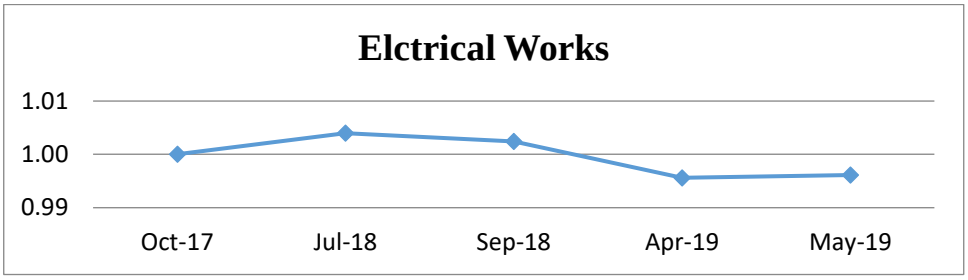


Figure 14 - Monthly inflation of electrical works for case 2

4.2.2.3.Finishing Work

From October 2017 onwards, inflation can be shown in the finishing work inflation formula Pn= [0.52+0.445* (GTn/GTo) +0.035 (Cn/Co)] using Granite Tile and Cement changes. The table in annexes 6 and 2 highlights the average price of granite tile and cement utilized in this segment.

Annex 12 contains descriptions of both adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from the federal police commission project.

Table 29- Inflation of granite tile for case 2

Pn=0.52+0.445(GTn/GTo) +0.035*(Cn/Co)		New Granite tile price / Old Granite tile price		New Cement price / Old Cement price	
M1	M2	M3	M4	M5	M6
Oct-17	Jun-18	Jul-18	Sep-18	Oct-19	Dec-19
1	1.03	1.08	1.05	1.17	1.17

Accordingly, the finishing work showed an average increase of 1.0833or 8.33% the last year.

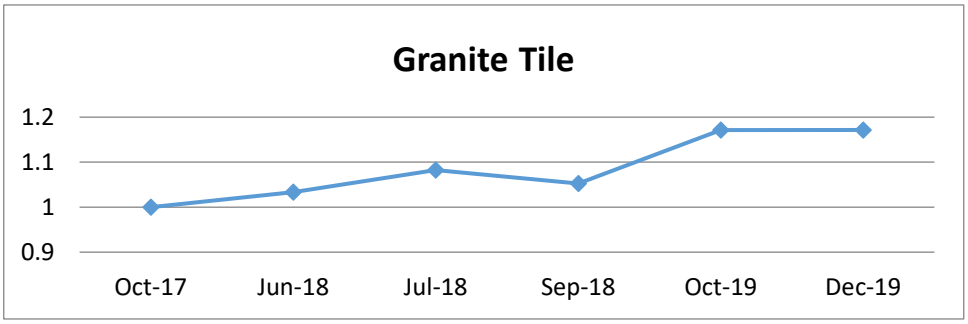


Figure 15- Monthly inflation of granite tile for case 2

4.2.2.4.Aluminum Work

From October 2017 onwards, inflation can be shown in the aluminum work inflation formula Pn= [0.59+0.41* (An/Ao) by using aluminum price changes. Annex 8 provides pricing information for aluminum window. Annex 12 contains summaries of adjustable contract items from the federal police commission project, as well as descriptions of non-adjustable contract items.

Table 20- Inflation of aluminum work for case 2

				Pn=0.59+0.41(An/Ao)				An- New Aluminum window Price Ao- Old Aluminum window Price							
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Time	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Oct-18	Nov-18	Dec-18	Nov-19
Pn	1	1	1	1	1	1	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05

Accordingly, the aluminum work showed an average increase of 1.05 or 5% the last year.

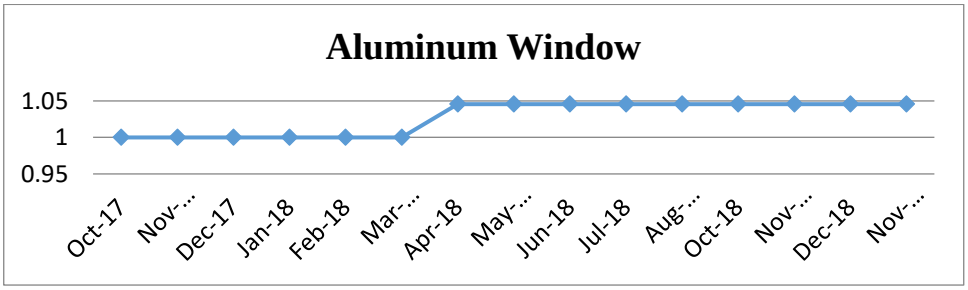


Figure 16-Monthly inflation of aluminum work for case 2

4.2.2.5.Masonry & Block work

From October 2017 onwards, inflation can be shown in the masonry& block work inflation formula Pn= 0.72+0.28* (Cn/Co) by using cement price changes. Annex 2 describes the cement price used in this calculation. Annex 11 contains summaries of adjustable contract items from the federal police commission project, along with adjustable and non-adjustable contract items.

Table 21- Inflation of masonry & block work for case 2

Pn=0.72+0.28(Cn/Co)							Cn- New Cement Price Co- Old Cement Price				
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03

Accordingly, the masonry work showed an average increase of 1.03 or 3% the last year.

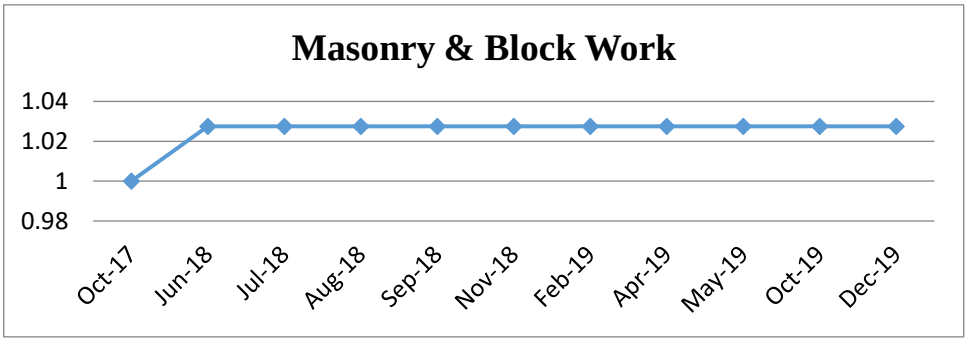


Figure 17- Monthly inflation of masonry & block work for case 2

4.2.2.6.Plastering Work

From October 2017 onwards, inflation can be shown in the plastering work inflation formula Pn= 0.75+0.25* (Pn/Po) by using cement price changes. The price of cement is shown in Annex2. Annex 11 describes summaries of adjustable contract items from the federal police commission project, along with adjustable and non-adjustable contract items.

Table 22- Inflation of plastering work for case 2

				Pn=0.75+0.25(Cn/Co)				Cn- New Cement Price Co- Old Cement Price			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.02452	1.02452	1.02452	1.02452	1.02452	1.02452	1.02452	1.024523	1.02452	1.02454

Accordingly, the plastering work showed an average increase of 1.025 or 2.5% the last year.

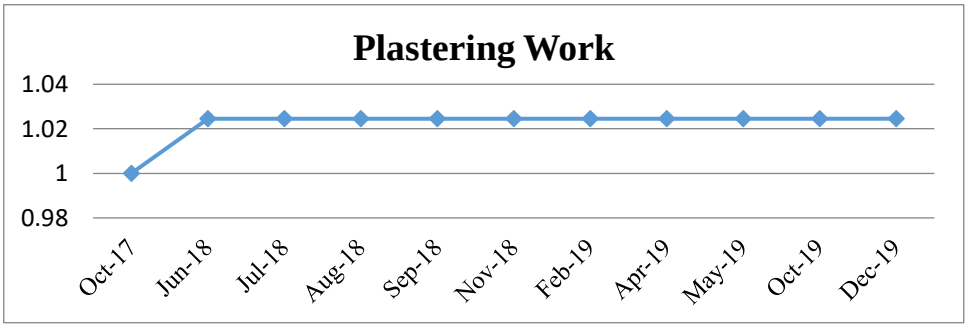


Figure18- Monthly inflation of plastering work for case 2

4.2.2.7.Structural steel work

From October 2017 onwards, inflation can be shown in the structural steel work inflation formula Pn= 0.3+0.7* (Rn/Ro) by using rectangular hollow section price changes. The price of rectangular hollow section is described in annex 7. Annex 12 includes summaries of adjustable contract items from the federal police commission project, along with adjustable and non-adjustable contract items.

Table 23- Inflation of structural steel work for case 2

Pn=0.3+0.7(Rn/Ro)							Rn- New RHS Price Ro- Old RHS Price					
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Time	Oct-17	Jan-18	Feb-18	Jun-18	Jul-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.21	1.37	1.30	1.33	1.34	1.32	1.35	1.31	1.33	1.35	1.34

Accordingly, the structural steel work showed an average increase of 1.297 or 29.7% the last year.

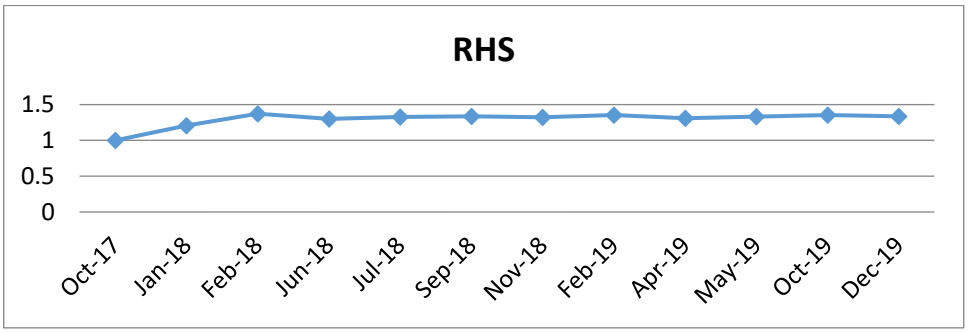


Figure 19- Monthly inflation of structural steel work for case 2

The following table shows the overall effect of the price increment on the total project cost/original contract price for federal police commission project.

Table 24- The percentage of total pressure anticipated for case 2

Trade of works	**% Cost**	**PA**	**Average material price increase**
Excavation and earth work	4.67		
Concrete works	32	0.42	13.44
Masonry & Block works	4.09	0.03	0.1227
Roofing and Water Proofing	3		
Carpentry &Joinery	4		
Steel &Metal works	9.76	0.297	2.8979775
Finishing works	15.10	0.11	1.66045
Painting	2.125		
Glazing	1.42		
Sanitary works	4.85		
Electrical works	19	0	0
Total	100		18.12

To summarize the above construction building project, it shows 18.12% increment in material costs due to currency devaluation.

4.2.3 Case study three: Construction of Office Building Work (Geophysics)

Table 26- Description of project for case study 3

Project:		Construction of Office Building Work (Geophysics)		
Employer:		Addis Ababa University		
Consultant:		Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector		
Contractor:		FE Construction PLC.		
Contract signing date:		18-May-17		
Original Contract Amount including VAT (A)		217,068,248.14		
Original Contract Amount Before VAT (B)=[(A)]/1.15		188,754,998.38		
I. No.	**Description of Works**	**Contract Amount (E)**	**Weighting Factor (F)=[(E)/(B)]**	**Weighting Factor (D)=[(F)] *%**
1	Concrete Work	60,933,220.00	0.32	32.28%
2	Electrical Installation	29,544,633.20	0.16	15.65%
3	Plastering & pointing	15,663,625.00	0.08	8.30%
4	Floor and Wall Finishing	15,538,400.00	0.08	8.23%
5	Aluminum Work	9,207,212.85	0.05	4.88%
6	Masonry & Block Works	9,080,450.00	0.05	4.81%

4.2.3.1.Concrete Work

From October 2017 onwards, inflation can be shown in the concrete work price adjustment formula Pn= [0.39+0.19* (Cn/Co) +0.42(Rn/Ro)] using cement and steel price changes. Annex 2 and 3 detail the cement and rebar costs used in this calculation. Annex 13 discusses adjustable and non-adjustable

contract items, as well as summaries of adjustable contract items from office building construction work (Geophysics).

Table 26- Inflation of concrete work for case 3

Pn=0.39+0.19Cn/Co) +0.42(Rn/Ro)						Cn- New Cement Price Co- Old Cement Price			Rn - New Rebar Price Ro - Old Rebar Price		
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.44	1.42	1.41	1.36	1.35	1.31	1.32	1.39	1.31	1.27

Accordingly, the concrete work showed an average increase of 1.33or 33% the last year.

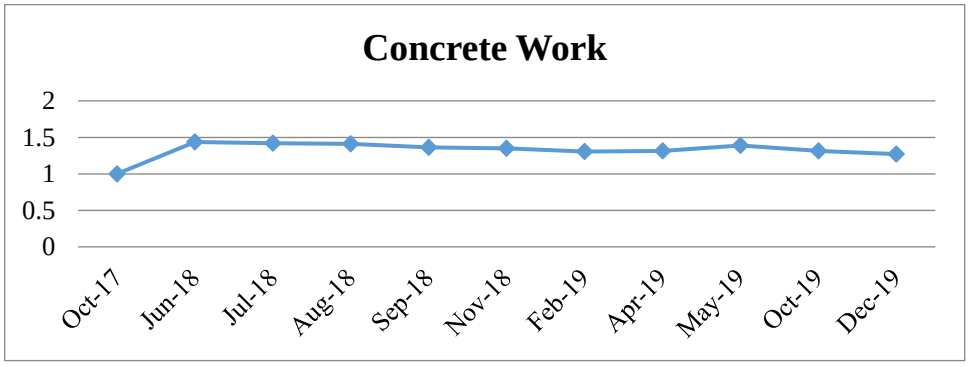


Figure 20- Monthly inflation of concrete work for case 3

4.2.3.2.Plastering Work

From October 2017 onwards, inflation can be shown in the plastering work inflation formula Pn= 0.79+0.21* (Cn/Co) by using cement price changes. The price of cement is shown in Annex2. Annex 13 describes summaries of adjustable contract items from the construction of office building work (Geophysics), along with adjustable and non-adjustable contract items.

Table 27- Inflation of plastering work for case 3

Pn=0.79+0.21(Cn/Co)						Cn- New Cement Price Co- Old Cement Price					
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.021	1.021	1.021	1.021	1.021	1.021	1.021	1.021	1.021	1.021

Accordingly, the plastering work showed an average increase of 1.021 or 2.1% the last year. Figure below shows monthly inflation of plastering work

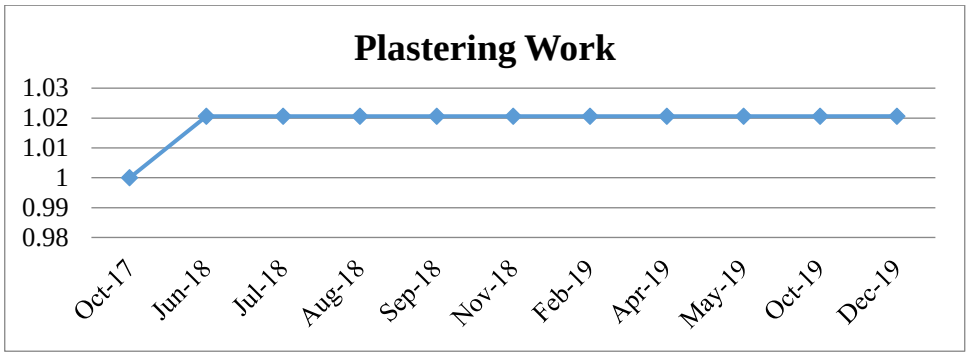


Figure 21-Monthly inflation of plastering work for case 3

4.2.3.3.Finishing Work

From October 2017 onwards, inflation can be shown in the finishing work inflation formula Pn= [0.46+0.5*(MTn/MTo) +0.04 (Cn/Co)] using marble tile and cement price changes. The table in annexes 5 and 2 shows the average cost of marble tile and cement used in this segment. Annex 14 includes explanations of both adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from office building construction work (Geophysics).

Table 28- Inflation of marble tile for case 3

Pn=0.46+0.5(MTn/MTo) +0.04(Cn/Co)			Cn- New Marble Tiles price Co- Old Marble Tiles price			Cn- New Cement price Co- Old Cement price	
	M1	M2	M3	M4	M5	M6	M7
Time	Oct-17	Jun-18	Jul-18	Sep-18	Apr-19	Oct-19	Dec-19
Pn	1	1.052311	1.06844	1.036182	1.060375	1.084569	1.100701

Accordingly, the finishing work showed an increase of 1.06 or 6% the last year

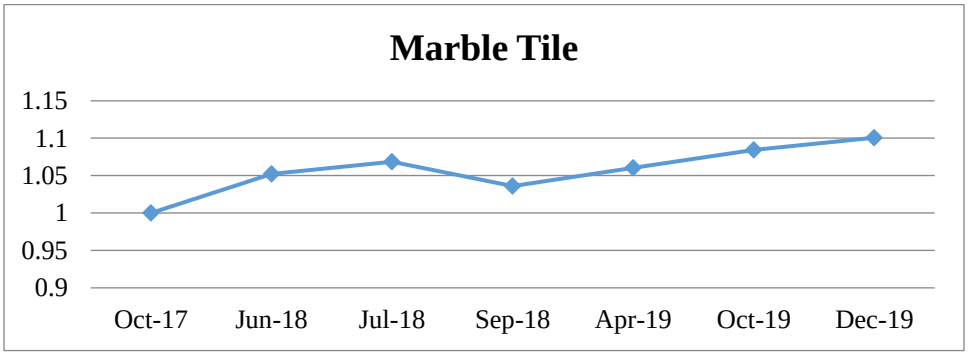


Figure 22- Monthly inflation of marble tile for case 3

4.2.3.4.Aluminum Work

From October 2017 onwards, inflation can be shown in the aluminum work inflation formula Pn= [0.34+0.66* (An/Ao) by using aluminum price changes. Annex 8 contains aluminum window price information. Annex 14 comprises summaries of the construction of office building work (Geophysics) adjustable contract items, as well as explanations of non-adjustable contract items.

Table 29-Inflation of aluminum work for case 3

				Pn=0.34+0.66(An/Ao)				An- New Aluminum window Price Ao- Old Aluminum window Price							
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Time	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Oct-18	Nov-18	Dec-18	Nov-19
Pn	1	1	1	1	1	1	1.07333	1.07333	1.07333	1.07333	1.07333	1.07333	1.07333	1.07333	1.07333

Accordingly, the aluminum work showed an average increase of 1.04 or 4% the last year.

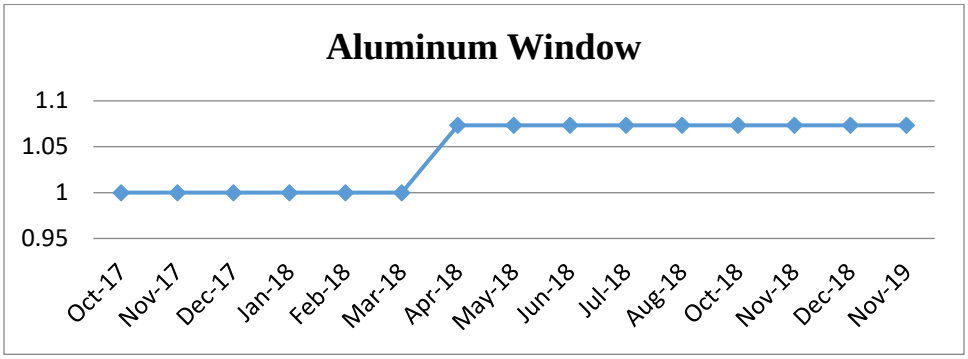


Figure 23-Monthly inflation of aluminum work for case 3

4.2.3.5.Masonry & Block work

From October 2017 onwards, inflation can be shown in the masonry & block work inflation formula Pn= 0.73+0.27* (Cn/Co) by using cement price changes. The cement price utilized in this computation is described in Annex 2. Annex 13 comprises summaries of adjustable contract items from office building construction work (Geophysics), as well as adjustable and non-adjustable contract items.

Table 30-Inflation of masonry & block work for case 3

Pn=0.73+0.27(Cn/Co)						Cn- New Cement Price Co- Old Cement Price					
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03

Accordingly, the masonry & block work showed an average increase of 1.03 or 3% the last year.

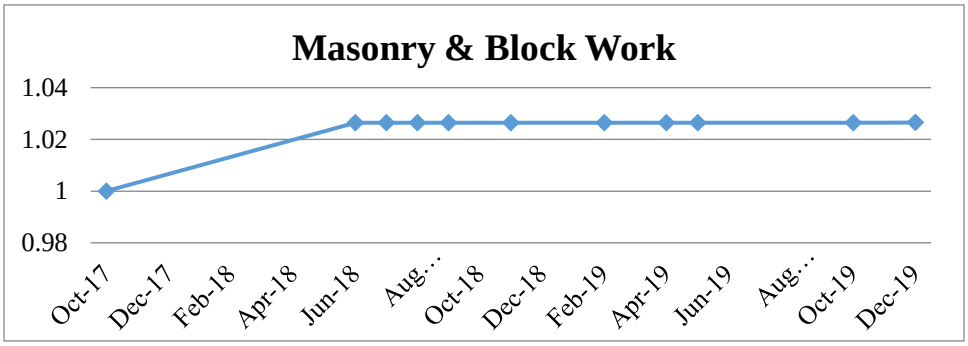


Figure 24-Monthly inflation of masonry & block work for case 3

4.2.3.6.Structural steel work

From October 2017 onwards, inflation can be shown in the structural steel work inflation formula Pn= 0.51+0.49* (Rn/Ro) by using rectangular hollow section price changes. Annex 7 describes the pricing of rectangular hollow section. Annex 14 contains summaries of the construction of office building work (Geophysics) adjustable contract items, as well as non-adjustable contract items.

Table 31-Inflation of structural steel work for case 3

Pn=0.51+0.49(Rn/Ro)							Rn- New RHS Price Ro- Old RHS Price					
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Time	Oct-17	Jan-18	Feb-18	Jun-18	Jul-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.15	1.26	1.21	1.23	1.24	1.23	1.25	1.22	1.23	1.25	1.24

Accordingly, the structural steel work showed an average increase of 1.21 or 21% the last year.

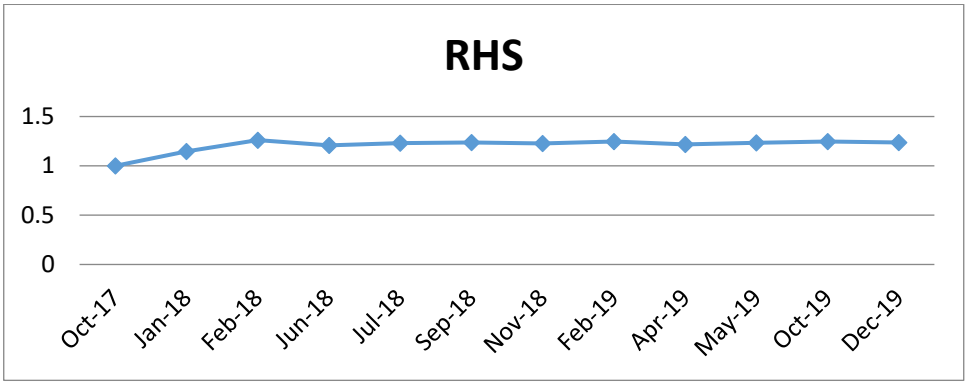


Figure 25- Monthly inflation of structural steel work for case 3

The following table shows the overall effect of the price increment on the total project cost/original contract price for construction of office building work (Geophysics).

Table 32-The percentage of total pressure anticipated for case 3

Trade of works	**% Cost**	**PA**	**Average material price increase**
Excavation and earth work	4.67		
Concrete works	32	0.33	10.56
Masonry & Block works	4.09	0.03	0.1227
Roofing and Water Proofing	3		
Carpentry &Joinery	4		
Steel &Metal works	9.76	0.21	2.049075
Finishing works	15.10	0.08	1.2076
Painting	2.125		
Glazing	1.42		
Sanitary works	4.85		
Electrical works	19	0	0
Total	100		13.94

Therefore, the above case study shows a 13.94% price increase on major works caused by currency devaluation.

4.2.4 Case study four: 4B+G+16 Government Communication Affairs Office

Table 33- Description of project for case 4

Project:		4B+G+16 Government Communication affairs Office complex		
Employer:		FDRE, Ministry of Urban &Housing -Federal Government Buildings Construction& Administration Bureau		
Consultant:		Yohannes abay Consulting Architects &Engineers		
Contractor:		Tekleberhan Ambaye Construction PLC		
Contract signing date:		12-Aug-16		
Original Contract Amount including VAT (A)		1,176,066,708.98		
Original Contract Amount before VAT (B)=[(A)]/1.15		1,022,666,703.46		
I. No.	**Description of Works**	**Contract Amount (E)**	**Weighting Factor (F)=[(E)/(B)]**	**Weighting Factor (D)=[(F)] *%**
1	Concrete Work	347,706,679.18	0.34	34.01%
2	Electrical Installation	215,782,674.00	0.21	21.10%
3	Floor and Wall Finishing	79,210,691.94	0.08	7.75%
4	Masonry & Block work	21,353,532.11	0.02	2.09%
5	Plaster & pointing	11,405,685.00	0.01	1.12%
6	Aluminum work	5,594,151.25	0.01	0.55%

4.2.4.1.Concrete Work

From October 2017 onwards, inflation can be shown in the concrete work price adjustment formula Pn= [0.23+0.19*(Cn/Co) +0.58 (Rn/Ro)] using cement and steel price changes. Annex 2 and 3 detail the cement and rebar costs used in this calculation. Annex 15 discusses adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from 4B+G+16 government communication affairs office project.

Table 34-Inflation of concrete work for case 4

	Pn=0.23+0.19Cn/Co)+0.58(Rn/Ro)				Cn- New Cement Price Co- Old Cement Price			Rn - New Rebar Price Ro - Old Rebar Price			
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.60	1.58	1.56	1.49	1.48	1.42	1.43	1.53	1.42	1.37

Accordingly, the concrete work showed an average increase of 1.44or 44% the last year.

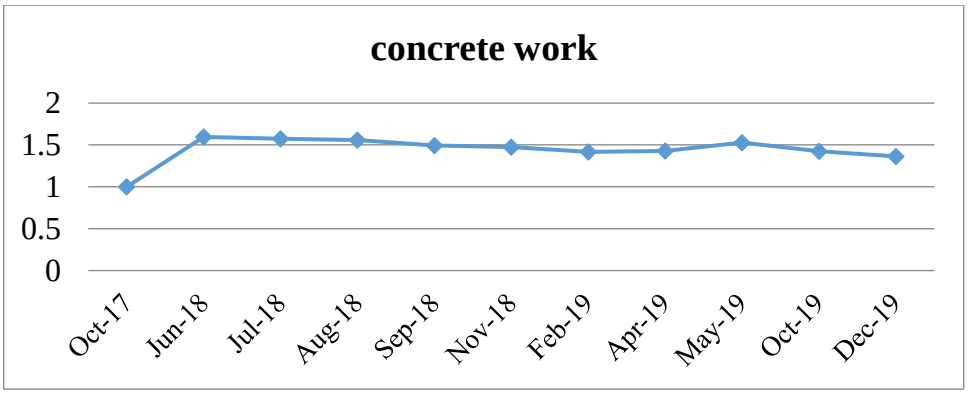


Figure 26-Monthly inflation of concrete work for case 4

4.2.4.2.Finishing Work

From October 2017 onwards, inflation can be shown in the finishing work inflation formula Pn= [0.66+0.26*(GTn/GTo) +0.08 (Cn/Co)] using Granite Tile and Cement changes. The table in annexes 6 and 2 shows the average cost of granite tile and cement used in this segment. Annex 16 includes

explanations of both adjustable and non-adjustable contract items, as well as summaries of adjustable contract items from 4B+G+16 government communication affairs office project.

Table 35-Inflation of granite tile for case 4

Pn= [0.66+0.26*(GTn/GTo) +0.08 (Cn/Co)]			New Granite tile price			New Cement price
			Old Granite tile price			Old Cement price
	M1	M2	M3	M4	M5	M6
Time	Oct-17	Jun-18	Jul-18	Sep-18	Oct-19	Dec-19
Pn	1	1.03	1.05	1.04	1.11	1.11

Accordingly, the finishing work showed an average increase of 1.06 or 6% the last year.

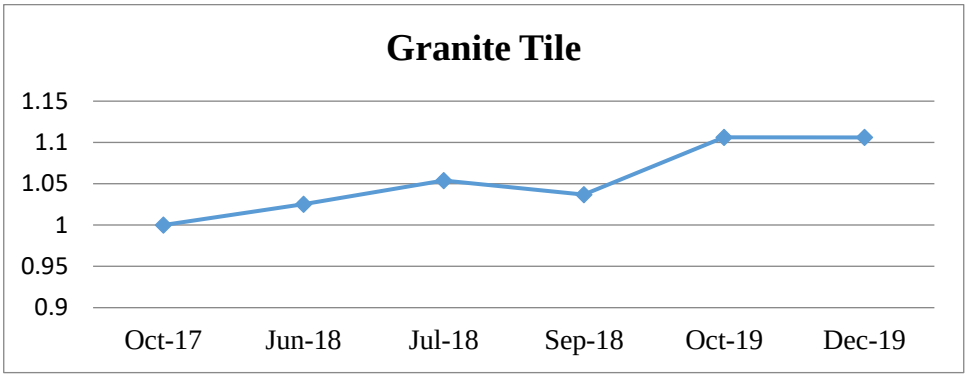


Figure 27-Monthly inflation of granite tile for case 4

4.2.4.3.Masonry& Block work

From October 2017 onwards, inflation can be shown in the masonry & block work inflation formula Pn= 0.67+0.33* (Mn/Mo) by using cement price changes. The cement price utilized in this computation is described in Annex 2. Annex 15 comprises summaries of adjustable contract items from 4B+G+16 government communication affairs office project, as well as adjustable and non-adjustable contract items.

Table 36- Inflation of masonry& block work for case 4

Pn=0.67+0.33(Cn/Co)							Cn- New Cement Price Co- Old Cement Price				
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.032	1.032	1.032	1.032	1.032	1.032	1.032	1.032	1.032	1.032

Accordingly, the masonry work showed an average increase of 1.032 or 3.2% the last year.

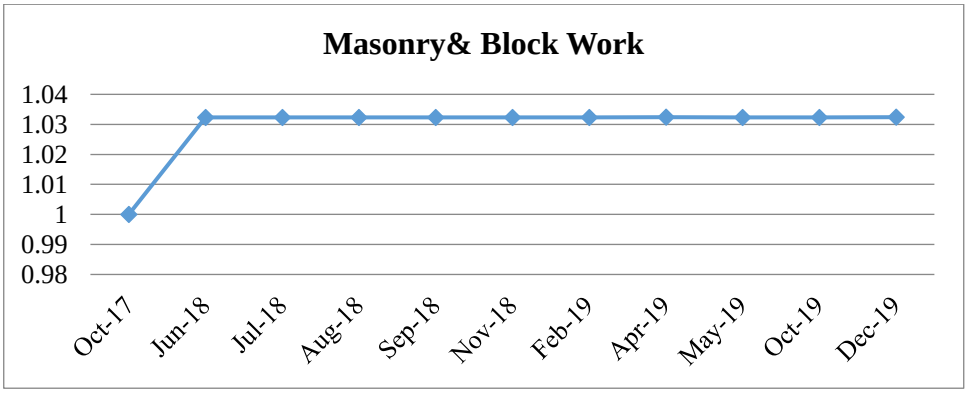


Figure 28-Monthly inflation of masonry & block work for case 4

4.2.4.4. Plastering Work

From October 2017 onwards, inflation can be shown in the plastering work inflation formula Pn= 0.74+0.26* (Cn/Co) by using cement price changes. The price of cement is shown in Annex2. Annex 15 describes summaries of adjustable contract items from 4B+G+16 government communication affairs office project, along with adjustable and non-adjustable contract items.

Table 37- Inflation of plastering work for case 4

Pn=0.74+0.26(Cn/Co)							Cn- New Cement Price Co- Old Cement Price				
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Time	Oct-17	Jun-18	Jul-18	Aug-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026	1.026

Accordingly, the plastering work showed an average increase of 1.026 or 2.6% the last year.

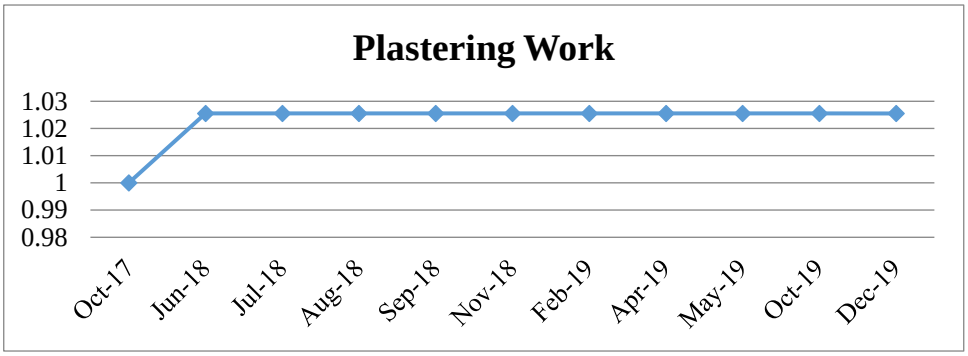


Figure 29-Monthly inflation of plastering work for case 4

4.2.4.5.Aluminum Work

From October 2017 onwards, inflation can be shown in the aluminum work inflation formula Pn= [0.54+0.46* (An/Ao) by using aluminum price changes. Annex 8 contains aluminum window price information. Annex 16 comprises summaries of the 4B+G+16 government communication affairs office project adjustable contract items, as well as explanations of non-adjustable contract items.

Table 38- Inflation of aluminum work for case 4

Pn=0.54+0.46(An/Ao)										An- New Aluminum window Price Ao- Old Aluminum window Price					
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Time	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Oct-18	Nov-18	Dec-18	Nov-19
Pn	1	1	1	1	1	1	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05

Accordingly, the aluminum work showed an average increase of 1.03 or 3% the last year.

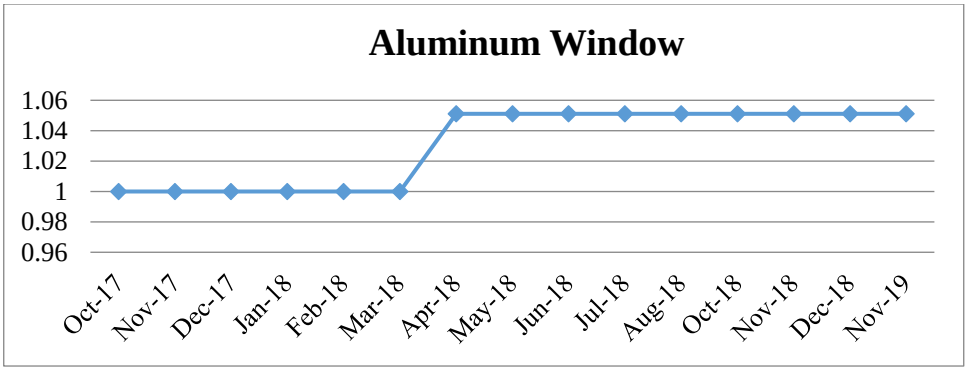


Figure 30-Monthly inflation of aluminum work for case 4

4.2.4.6. Structural steel work

From October 2017 onwards, inflation can be shown in the structural steel work inflation formula Pn= 0.48+0.52* (Rn/Ro) by using rectangular hollow section price changes. Annex 7 describes the pricing of rectangular hollow section. Annex 16 comprises summaries of the 4B+G+16 government communication affairs office project adjustable contract items, as well as explanations of non-adjustable contract items.

Table 39-Inflation of structural steel work for case 4

				Pn=0.48+0.52 (Rn/Ro)				Rn- New RHS Price Ro- Old RHS Price				
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Time	Oct-17	Jan-18	Feb-18	Jun-18	Jul-18	Sep-18	Nov-18	Feb-19	Apr-19	May-19	Oct-19	Dec-19
Pn	1	1.15499	1.27719	1.22191	1.24435	1.25017	1.23999	1.26305	1.23084	1.24747	1.26326	1.25017

Accordingly, the structural steel work showed an average increase of 1.22 or 22% the last year.

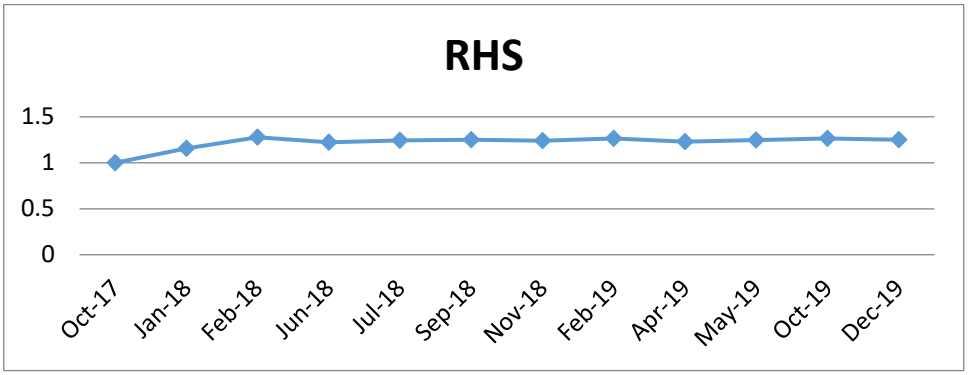


Figure 31-Monthly inflation of structural steel work for case 4

The following table shows the overall effect of the price increment on the total project cost/original contract price for 4B+G+16 government communication affairs office.

Table 40-The percentage of total pressure anticipated for case 4

Trade of works	**% Cost**	**PA**	**Average material price increase**
Excavation and earth work	4.67		
Concrete works	32	0.44	14.08
Masonry & Block works	4.09	0.032	0.13088
Roofing and Water Proofing	3		

Carpentry &Joinery	4		
Steel &Metal works	9.76	0.22	2.14665
Finishing works	15.10	0.09	1.35855
Painting	2.125		
Glazing	1.42		
Sanitary works	4.85		
Electrical works	19	0	0
Total	100		17.72

Therefore, the above case study shows a 17.72% price increase on material input of major works caused by currency devaluation.

4.2.5. Comparison and summary of four case study projects result

As a literature review, the thesis discusses the effect of currency devaluation on the construction projects and as analysis, it discusses and explains how much currency devaluation affects the original cost of the construction projects on materials input.

From the above four case study projects, it was learned that major components of building construction work, such as concrete, finishing, steel and metal work, and masonry and block work, have been shown to be significantly triggered by currency devaluation. Therefore, the Federal Police Commission Project shows an 18.12% increment in project cost due to currency devaluation, which is the highest inflation total pressure of all case study projects.

Accordingly, in the case of the 4B+G+16 Government Communication Affairs Office Complex and Federal Police Commission projects, concrete work shows an average increase of 44% and 42% respectively. Whereas 33% and 39% of the average price increment of concrete work is recognized in the case of construction of office buildings (Geophysics) and School of Journalism and Mass Communication Projects, respectively, the increase in the price of construction inputs caused by currency devaluation, concrete work takes the lion's share, which shows the highest price increment

among other work items. Similarly, structural steel work shows an average increase of 28% and 29.7% in the case of the School of Journalism and Mass Communication and Federal Police Commission Projects. Whereas in the case of construction of office buildings (Geophysics) and 4B+G+16 Government Communication Affairs Office Complex projects show an average increase of 21% and 22%, finishing work took 3rd place to show an average increase of 6.33% and 8.33%, respectively. In the case of the school of journalism and mass communication, the federal police commission, the construction of office buildings (Geophysics) and the 4B+G+16 Government Communication Affairs Office Complex projects show a rise of 6%respectively.

Therefore, it confirms that currency devaluation has a direct impact on the implementation of construction projects in relation to executing contracts signed prior to the devaluation. And it led to an increase in the construction materials prices on building projects, which had the effect of increasing the project cost and disrupting the contract price by 16.51%, 18.12%, 13.94% and 17.72% respectively. As stipulated in the literature review, the price escalation of construction materials, which is driven by currency devaluation, leads to an increase in the project cost.

4.3 Contributory Trade of Works due to Currency Devaluation

To determine the contributory trade of works induced by currency devaluation, ten public building projects were reviewed for pre and post devaluation periods. The price of construction works in different time periods was examined in depth to identify which trades are vulnerable to currency devaluation.

4.3.1 Concrete work

The price of sub and superstructure concrete work showed almost no increment after currency devaluation. The price of concrete work has increased from birr 3229 to birr 3298 and from 3266 birr to 3298 birr per m3 respectively, an increase of 2% and 1%. It shows an average increase of 41% from the base year 2016.

Table 41-Price of concrete work before and after currency devaluation

reinforced sub structure concrete work	Unit	May- Aug 16	May-17	Jan- Dec 18	Mar-19	Feb-Sep20	Price Diff
In situ concrete							
C-25 in isolated & continuous footing	m^3	2,600	3,200	3,298	2,922	3,700	42%
C-25 in foundation column	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-25 in lift foundation wall	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-25 in retaining wall	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-25 in beam	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-25 in Mat foundation	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-25 foundation shear wall	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-20 in slab and entrance steps	m^3	2,600	3,229	3,298	2,922	3,700	42%
C-30 in foundation column (water tight concrete)	m^3	3,304	3,777	3,349	3,323	4,354	32%
reinforced super structure concrete work							
In Situ Concrete	**Unit**	**May- Aug 16**	**May-17**	**Jan- Dec18**	**Mar-19**	**Feb-Sep20**	**Price Diff**
C-25 in elevation column	m^3	2,600	3,266	3,298	2,292	3,700	42%
C-25 in beams	m^3	2,600	3,266	3,298	2,922	3,700	42%
C-25 in lift shaft wall	m^3	2,600	3,266	3,298	2,922	3,700	42%
C-25 in concrete gutter slab	m^3	2,600	3,266	3,298	2,922	3,700	42%
C-25 in stair case	m^3	2,600	3,266	3,298	2,922	3,700	42%
C-25 in suspended solid slab	m^3	2,600	3,266	3,298	2,922	3,700	42%
C-25 shear wall	m^3	2,600	3,266	3,298	2,922	3,700	42%
C-30 in shear wall & elevation column	m^3	3,304	3,777	3,349	3,323	4,413	34%
Average reinforced concrete work price increment							41%

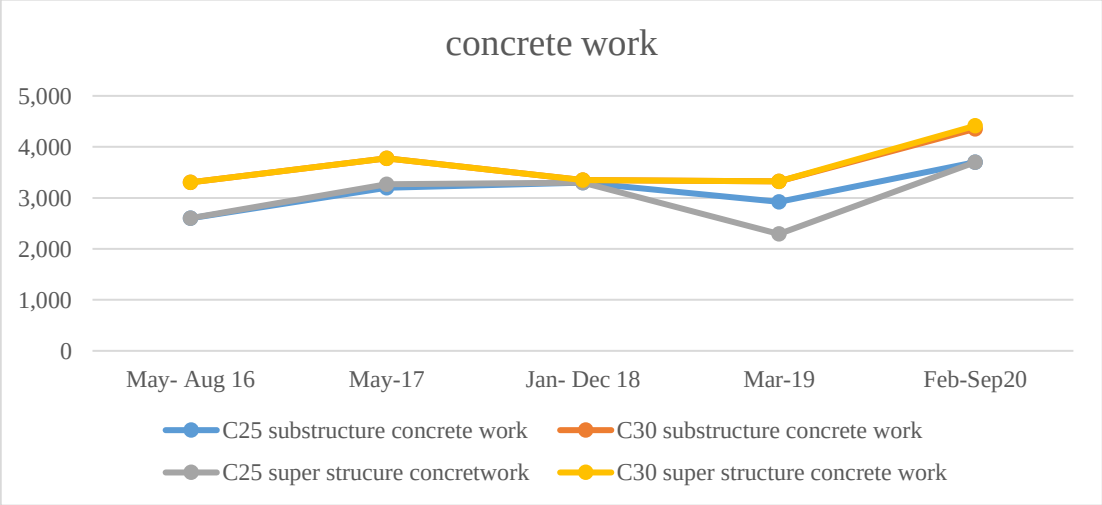


Figure 32-Price of concrete work pre and post devaluation

4.3.2 Formwork

The table below shows the price of form work before and after currency devaluation, which has been taken from ten projects. The price of sub structure form work showed an increment from 250 birr to 265 birr, whereas the price of super structure form work increased from 275 to 287 after currency devaluation. After that, price fluctuation has been exhibited in 2019 and 2020. The average price increment from the base year 2016 is 104%.

Table 42- Price of form work before and after currency devaluation

Form work	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
Sub structure normal finish to:-							
Isolated & continuous footing	m²	190	250	265	209	388	104%
Foundation column	m²	190	250	265	209	388	104%
Lift foundation wall	m²	190	250	265	209	388	104%
Retaining wall	m²	190	250	265	229	388	104%
Beam	m²	190	250	265	229	388	104%
Steps	m²	190	250	265	229	388	104%
shear Wall	m²	190	250	265	229	388	104%
stair case	m²	190	250	265	229	388	104%
ramp slab	m²	190	250	265	229	388	104%
super structure normal finish to:-							
Eleveation column	m²	190	275	265	213	388	104%
Shear wall	m²	190	275	287	253	388	104%
Parapet & gutter	m²	190	275	287	253	388	104%
beams for all floors,roof, tie beams & lintels	m²	190	275	287	193	388	104%
Staircase	m²	190	275	287	253	388	104%
Suspended floor & roof slab	m²	190	275	287	253	388	104%
Concrete gutter slab	m²	190	275	287	253	388	104%
Average formwork price increment							104%

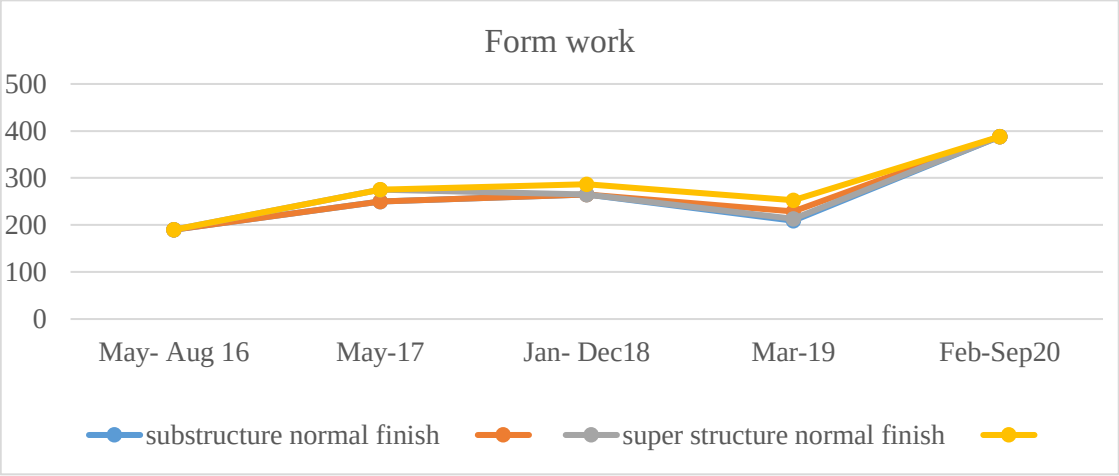


Figure 33-Price of form work pre and post devaluation

The price of reinforcement steel bar before and after currency devaluation, which has been taken from projects, has shown a considerable variation. After currency devaluation, it increased from 36 birr to 60 birr per kg, an increase of 66%. The average price increment from the base year 2016 is 100%.

Table 43-Price of reinforcement steel bar before and after currency devaluation

Reinforcement steel bar	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
Sub structure							
Diameter, 24 mm	kg	33	36	60	60	66	100%
Diameter, 20 mm	kg	33	36	60	60	66	100%
Diameter, 16 mm	kg	33	36	60	60	66	100%
Diameter, 14 mm	kg	33	36	60	60	66	100%
Diameter, 12 mm	kg	33	36	60	60	66	100%
Diameter, 10 mm	kg	33	36	60	60	66	100%
Diameter, 8 mm	kg	33	36	52	60	66	100%
super structure							
Diameter, 24 mm	kg	33	36	60	60	66	100%
Diameter, 20 mm	kg	33	36	60	60	66	100%
Diameter, 16 mm	kg	33	36	60	60	66	100%
Diameter, 14 mm	kg	33	36	60	60	66	100%
Diameter, 12 mm	kg	33	36	60	60	66	100%
Diameter, 10 mm	kg	33	36	60	60	66	100%
Diameter, 8 mm	kg	33	36	52	60	66	100%
Average reinforcement steel bar price increment							100%

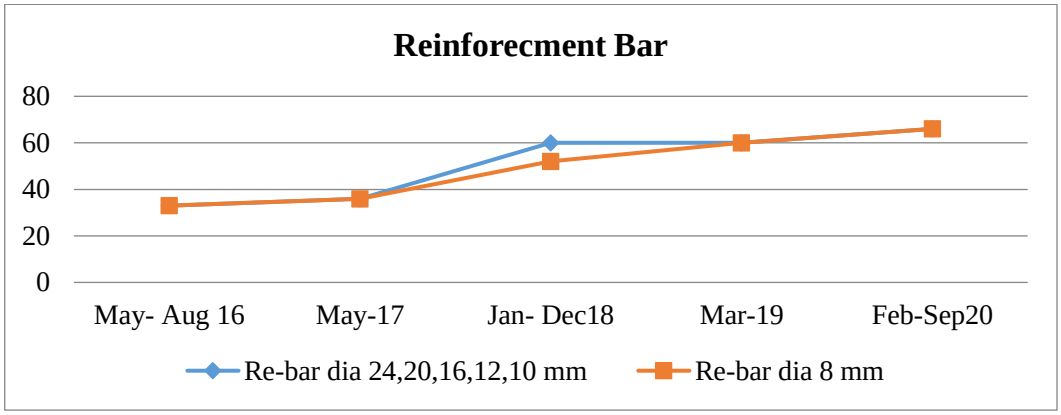


Figure 34- Price of reinforcement bar pre and post devaluation

4.3.3 Masonry Work

The price of masonry work before and after currency devaluation, which has been taken from ten projects, showed price escalation after currency devaluation increased from 2000 birr to 2600 birr per m3, an increase of 30%, but then it displayed a decline in price in 2019 and 2020. The average price increased by 46% from the base year of 2016.

Table 44-Price of masonry work before and after currency devaluation

Masonry work	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
Stone wall, in cement mortar							
Concealed from view	m3	1,500	2,000	2,600	2,300	2,497	66%
Exposed face for further finish	m3	2,000	2,000	2,600	2,300	2,497	25%
Average Masonry work price increment							46%

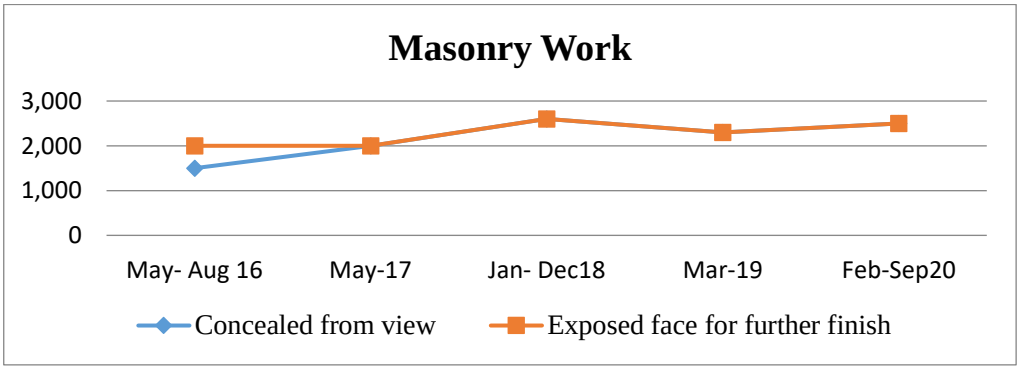


Figure 35-Price of masonry work pre and post devaluation

4.3.4 Block work

The table shows the price of different sizes of blocks before and after currency devaluation, which has been taken from projects from May 2016 to Sep 2020. It shows an average increase of 66.49%.

Table 45-Price of block work before and after currency devaluation

Concrete block works Class "B"	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
Above grade wall in cment mortar							
20 cm thick both faces for plaster	m2	375	470	477	414	610	63%
15 cm thick both faces for plaster	m2	320	429	441	382	545	70%
10cm thick both faces for plaster	m2	271	381	410	354	450	66%
Average Block work price increment							66%

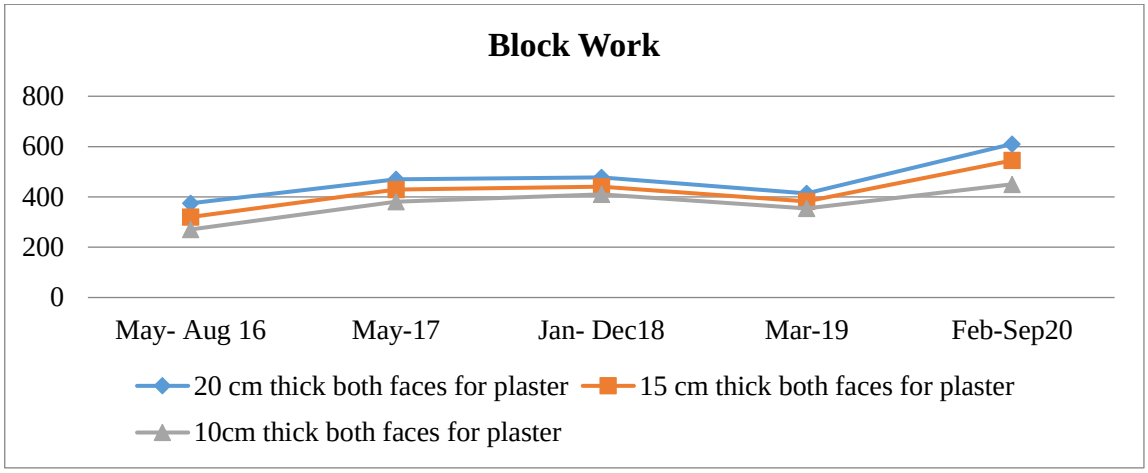


Figure 36-Price block work pre and post devaluation

4.3.5 Roof work

The price of selected roofing materials, such as pre-painted EGA sheets, also showed a rise after the currency devaluation. The average price of EGA 500 with 0.4mm thick has increased by 59%, but after that, the last project showed a discount. See the following table. The average price of roofing work shows an increment of 38% from the base year 2016.

Table 46-Price of roof work before and after currency devaluation.

Galvanized Corrugated steel Sheet & Accessories	Unit	May- Aug 16	May-17	Jan- Dec18	Feb-Sep20	Price Diff
Roofing						
Pre painted EGA 500, 0.4mm thick	m^2	568	589	937	620	9%
Galvanized plain steel sheet accessories, Ridge cap						
0.4mm thick girth 50cm	m	173	274	310	289	67%
Average Roof work price increment						38%

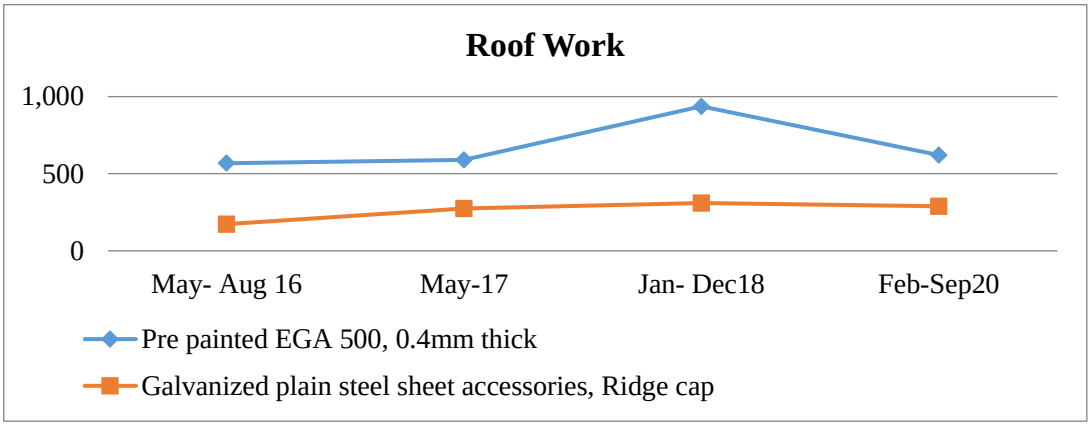


Figure 37-Price of roof work pre and post devaluation

4.3.6 Structural Steel Works

The table shows the cost of structural steel works before and after currency devaluation, projects from May 2016 to September 2020. The price of structural steel work has shown a rise after the currency devaluation. The price of RHS truss has increased from 75 birr to 98 birr per kg, an increase of 30.66%. After that, it showed a slight decline in the price of work and then it showed an increment in September 2020. The average price has increased by 78% from the base year of 2016. See the following table.

Table 47-Price of structural steel work before and after currency devaluation

STEEL STRUCTURE	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
RHS TRUSS							
Size - 80x80x3.5mm	Kg	50	75	98	79	104	107%
Size - 60x60x3.0mm	Kg	50	75	98	79	104	107%
Purlin lattice type							
Size - 25x25x2.5mm	Kg	50	75	98	79	104	107%
Diameter 14mm	Kg	50	42	98	79	104	107%
Plate							
8mm thick	Kg	50	75	98	79	104	107%
Angle ties							
Size 40x40x6mmL=60mm	Kg	50	110	98	79	104	107%
Size 75x50x8mmL=80mm	Kg	50	110	98	79	104	107%
Anchore bolts							
Size - diameter 16mm L=90cm	No	500	420	575	348	502	0%
Bolts							
M16	No	250	250	250	146	250	0%
M12	No	150	218	150	122	201	34%
Average Steel structure price increment							78%

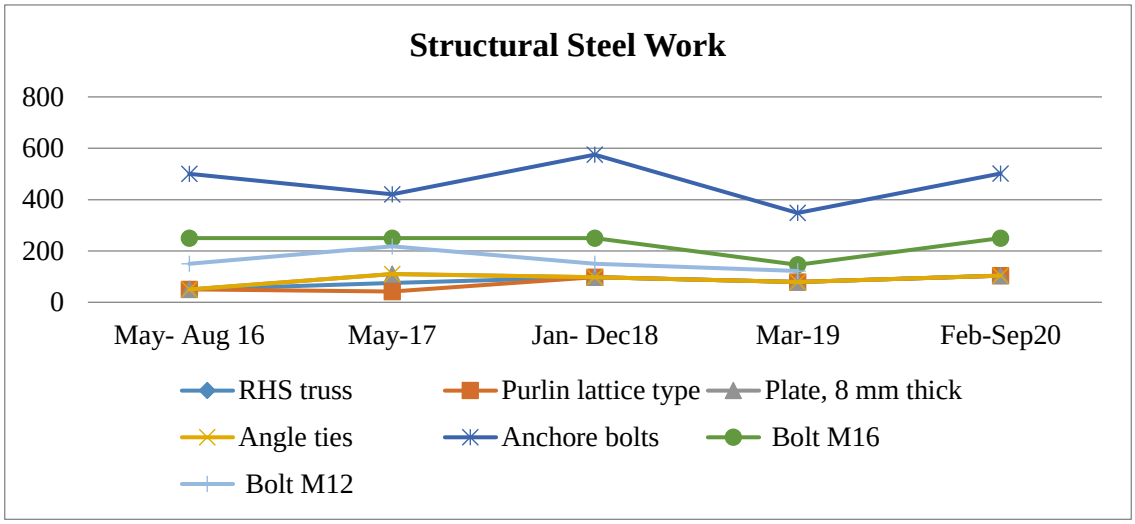


Figure 38-Price of structural steel work pre and post devaluation

4.3.7 Finishing work

The table below shows the price of plastering work before and after currency devaluation, which has been taken from projects from 2016 to 2020. The price of plastering work shows price fluctuation and it shows an average increase of 255% from the base year of 216.

Table 48-Price of plastering work before and after currency devaluation.

Two coats of plaster	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
In cement mortar to internal surface of :-							
Hollow concrete block wall surface	m2	115	137	210	188	299	160%
Concrete vertical surface	m2	115	152	210	188	299	160%
Concrete soffit	m2	115	152	210	188	299	160%
In cement mortar to external surface of :-							
Hollow concrete block wall surface	m2	50	152	210	188	305	501%
Concrete vertical surface	m2	50	166	210	220	305	501%
Fine coat gypsum plaster to:-							
Internal plastered vertical surface	m2	50	59	180	120	127	154%
Concrete soffit surface	m2	50	59	180	110	127	154%
Average Plastering work price increment							255%

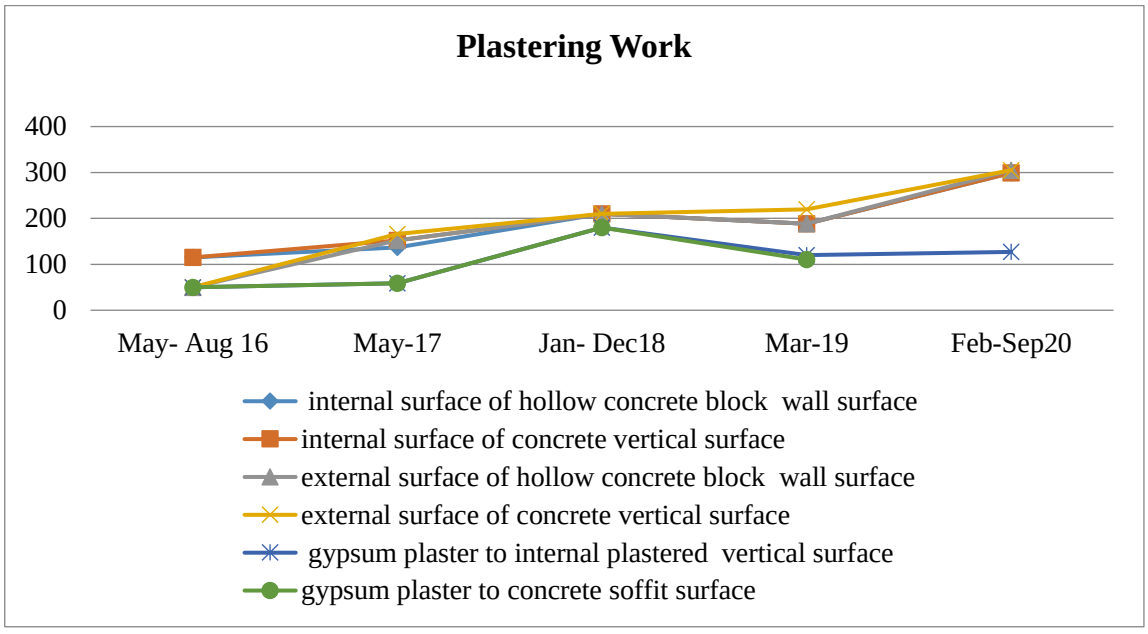


Figure 39- Price of plastering work pre and post devaluation

The table below shows the price of floor & wall finishing work before and after currency devaluation, which has been taken from projects from 2016 to 2020. It shows an average increase of 121% from the base year 2016.

Table 49-Price of floor and wall finish before and after currency devaluation

FLOOR &WALL FINISH	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
Cement Screed floor							
48 mm thick cement screed smooth finish (undercarpet, pvc)	m2	150	201	198	300	321	114%
10x2cm cement tile skirting	m	150	201	198	300	321	114%
Carpet flooring							
Debrebrhan or equivalent carpet approved type	m2	945	1,214	2,500	999	1,425	51%
10cm high wooden skirting	m	150	218	225	172	350	133%
Ceramic wall tile							
6mm thick (WC area room hight)	m2	450	489	792	731	777	73%
Non slippery ceramic floor tile & skirting							
Shall be in compliance with ES C.D 2,003 Ethiopian standard							
10mm thick	m2	670	743	892	842	1,047	56%
Ceramic skirting	m	100	179	214	223	250	150%
porcelain floor tile & skirting							
Shall be in compliance with ES C.D 2,003 Ethiopian standard							
10mm thick	m2	350	737	856	870	1,129	182%
Porcelain skirting	m	100	139	128	137	207	107%
PVC floor tile and skirting							
Shall be in compliance with (BS 3261) quality standard							
2 mm thick	m2	350	416	489	500	777	122%
10cm high Skirting	m	75	114	118	160	250	233%
Average Floor&Wall Finishing work price increment							121%

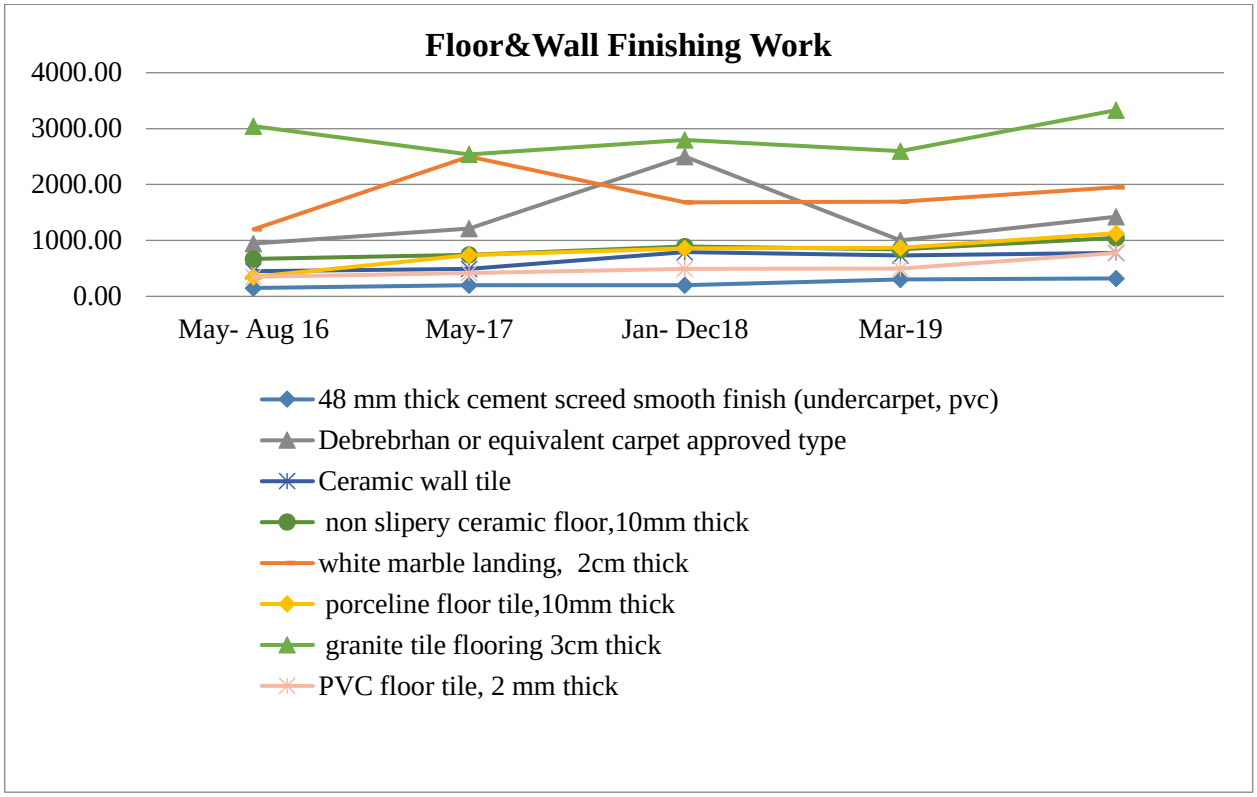


Figure 40-Price of floor and wall finishing work pre and post devaluation

4.3.8 Painting

The price of painting doesn't show an increment after currency devaluation, it shows a decline in March 2019 and a rise in 2020. It shows an average increase of 140% from the base year 2016. See the following table below.

Table 50- Price of panting before and after currency devaluation

PAINTING	Unit	May- Aug 16	May-17	Jan- Dec18	Mar-19	Feb-Sep20	Price Diff
Plastic Emulsion paint to:-							
Internal plastered vertical surface	m²	32	62	62	53	80	150%
Concrete ceiling	m²	33	66	65	59	80	142%
plastred soffit surface	m²	35	63	65	59	80	128%
Average painting work price increment							140%

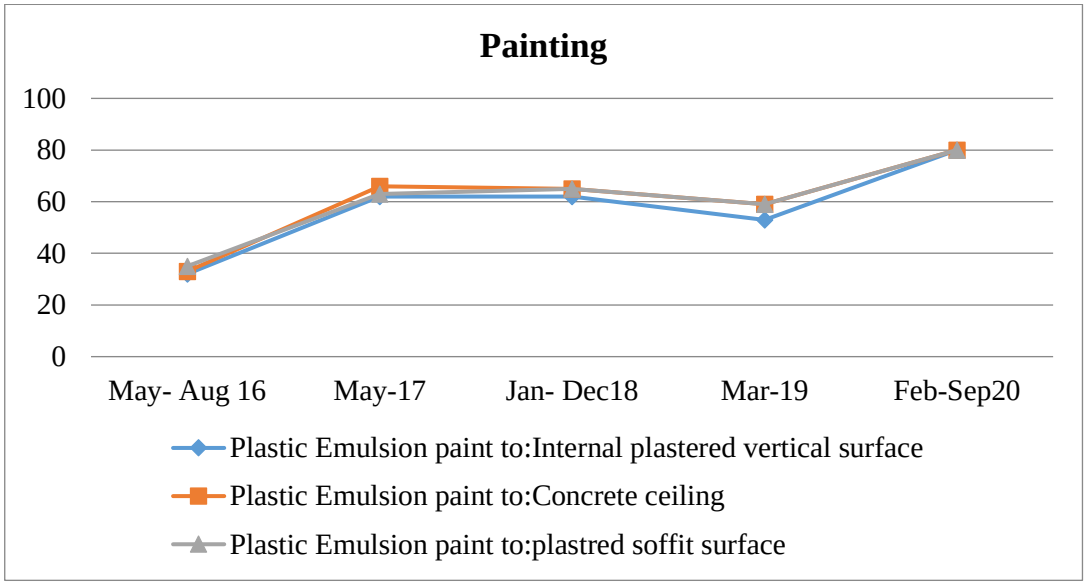


Figure 41- Price of painting pre and post devaluation

4.3.9 Glazing

The price of glazing work doesn't show the full trend, but after the currency devaluation, the price of glazing work increased from 500 birr to 1000 birr per m2, an increase of 100% and the average increment from the base year 2016 is 122%.

Table 51- Price of glazing before and after currency devaluation

GLAZING	Unit	May- Aug 16	May-17	Jan- Dec18	Price Diff
Transparent clear glass					
4mm thick (only on wooden doors)	m²	450	500	1,000	122%
Average glazing work price increment					122%

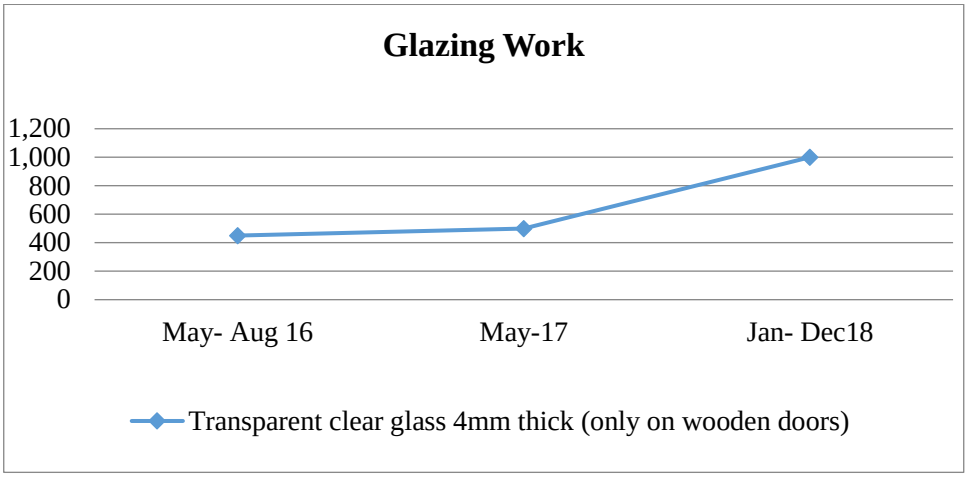


Figure 42- Price of glazing work pre and post devaluation

4.3.10 Electrical installation

With respect to electrical installation, the price of switches didn't show a major price change after currency devaluation. After that, it shows an increment in 2020. The average price increment is 140 % from the base year 2016. See the following table.

Table 52- Price of Electrical installation before and after currency devaluation

SWITCHES IP54	Unit	May- Aug 16	May-17	Jan- Dec18	Feb-Sep20	Price Diff
3rd party certified						
10A/1ph flush mounted with appropriate cover plate , frame and box. Note use modular appropriate back box for concrete , masonry wall & for light or gypsum wall						
1-way	No	250	122	250	600	140%
Two-gang 1-way	No	250	264	250	600	140%
2-way	No	250	122	250	600	140%
Intermediate	No	250	335	250	600	140%
Three-gang 1-way	No	250	600	250	600	140%
Average electrical instalation price increment						140%

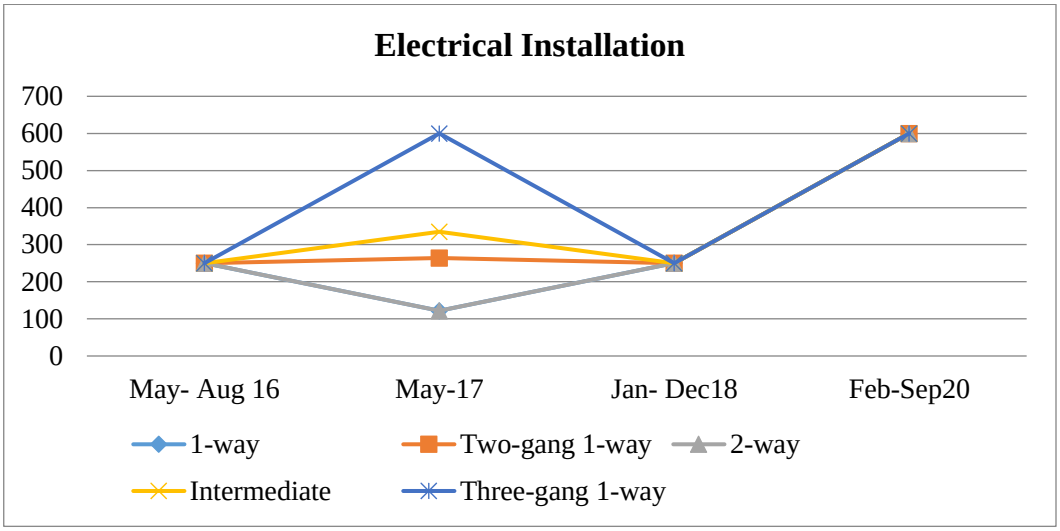


Figure 43- Price of electrical installation pre and post devaluation

Tangible increment in the price of construction works discussed above shows exactly how the cost of trade has considerably increased resulting from the execution of the currency devaluation. Therefore, most of the trades discussed above show price increment immediately after the execution of the currency devaluation but then show price decline after the devaluation. Accordingly, reinforced concrete work shows gradual increment throughout the period exhibited by ten projects. Similarly, wall and floor finishing work were found contributory to currency devaluation based on case projects.

4.4. Minimizing Effect of Currency Devaluation for Current Situation and Long Run Occurrence

In connection with inflation in the country during the fiscal year 2010, which led to an increase in the cost of construction materials, has caused significant losses to domestic contractors and the construction industry. Therefore, it is essential for the government to take action that will overwhelm the effect of currency devaluation realized on the above case study projects.

In the event of such problems, the way our country or other countries resolve them is through the Ex-Gratia claim process, which makes them uniquely determined by the government. In this manner, the ministry of construction and urban development requests solutions to the increase in construction input costs caused by currency devaluation, according to the data provided by the ministry of urban

development and construction. The ministry of finance issued guidelines for the price fluctuation of cement rebar and ceramic inputs since some procurement companies do not include the possibility of price adjustments in the contract, plus other procuring entities include provision for price adjustments in the contract, but a request for price adjustment from contractors failed to respond immediately.

Therefore, in order to solve the problem in the sector in a sustainable way, it is expected that procurement and property management will be amended. In accordance with the federal government procurement and property management, procurement and implementation directive as well as the construction bid procurement regulations, considering the provisions, a price adjustment may be made.

- If it is not due to poor performance of the contractors or inability to carry out their construction work on time according to the contract, a contract document stating that price adjustments may be made in accordance with article 16/4 and article 16/7/3 of the procurement implementation guidelines should be included in the bidders' guidelines and special contract conditions.
- According to article 16/14/3 of the implementation directive, the list of construction inputs to be adjusted, including cement, re-bar, and ceramic inputs, should be adjusted and pre-determined by including the bid document and contract document.
- Procurement implementation guidelines for request of price adjustment from contractors by applying the price adjustment in accordance with the details of the bidding document and the price adjustment formula and timely response as well.
- For the construction contractors who have previously signed the contract with out and don't have a price adjustment clause, it is necessary to provide the **cement, re-bar, and ceramic** inputs in accordance with the provisions of article 29/4 of the executive directive and the general conditions of the amendment provisions and adjust the price of the **remaining works** by following the adjustment formula.

Therefore, ministry of finance acts through passing instructions in order to avoid the harm that can be in the construction industry, especially domestic contractors but these guidelines will be used only for the price adjustment of remaining works it doesn't allow to compensate contracts which were executed.

Therefore, to minimize the current situation induced thru currency devaluation by considering and changing **Egypt's devaluation issues and measures** in our context to compensate contractors who work for government projects and were adversely affected by the recent currency devaluation adopted by the Government during 2010.

Compensation criteria should include

- The price adjustment will only apply to projects signed before the price change on October 1st, 2010 E.C and only to projects that can be assured they will not end due to inflation caused by currency devaluation. It also applies to projects that can ensure when a time extension is needed, it will be accommodated on either a contract or administrative basis.

- The price adjustment is calculated for cement, reinforcement bar, RHS, including aluminum, granite, ceramic, and other wall and floor finishing inputs, for concrete steel and metal, and finishing work only.

- The inflation adjustment is provided based on the formula and a reliable source of prices.

$$PAI= A+b (CTc/CTb) +c (RBc/RBb) +d (Sc/Sb) +e (GR,CRc/GR,CRb)$$

PAI= price adjustment index

A, b, c, d, e= price adjustment weightings for respective permitted construction materials and their sum shall be 1

CT=cement, RB= reinforcement bar, S= steel and metal, GR, CR= granite, ceramic and other wall and floor finishing materials

C and b =current and basic prices from reliable sources

In order minimize effect of currency devaluation for future occurrence adopting Mexico's public works and related services law that allows contracts to be increased or reduced, based on an index is necessary. Somehow the Ethiopian roads authority (ERA), which is part of the procurement of road projects, is better to implement price adjustment. The supply is well implemented by adjusting the values of three road construction inputs such as equipment, bitumen and reinforcement bar, based on an index of U.S bureau of labor statistics. As well the building construction sectors should exercise contracts to be

increased or decreased based on an index by adjusting most contributory trade of works due to currency devaluation.

Chapter four has presented analysis and discussion of the research findings addressing the three research questions of this study. As shown on the analysis the price escalation adjusted for material inputs will be 16.51%, 18.12%, 13.94% and 17.72% of the original cost/contract price. Furthermore, reinforced concrete work and wall & floor finishing work found contributory to currency devaluation. Chapter five presents conclusion and recommendation of the research.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

After the National Bank of Ethiopia officially devalued the value of the birr by 15% against the US dollar in October 2017, its consequences have been shown in the price of construction materials, which affects the performance of domestic contractors in relation to implementing contracts prior to the devaluation. A case study was done aimed at identifying the impact of currency devaluation on public building construction projects and demonstrating the trade of works which is contributory to currency devaluation. It also revealed how the effect of currency devaluation will be minimized for current and future occurrences. The results of the study showed that an increase in construction material prices persuaded by currency devaluation led to an increase in the project's cost by 18.12%, 17.72%, 16.51% and 13.94% based on the case projects. This leads the contractor going through a financial crisis resulting from devaluation. On the other hand, it has significantly delayed projects that had been intended to be finished. This situation will also affect directly the project and contractors, and indirectly suppliers.

From the analysis and discussion in this paper, reinforced concrete work and wall and floor finishing work were found to be contributory to currency devaluation since the construction industry is dependent on imported construction inputs. However, there's always a way out of every challenge if proper consideration is given. The study concludes that by using the approach of Egypt's and Mexico's currency devaluation issues and measures to minimize the current risk of currency devaluation, domestic contractors can be compensated based on the criteria discussed above for projects that are not finished yet due to the high cost of construction inputs and are not considered in the agreed contract price.

Adopting Mexico's public works and related services law, which allows the contract amount to be increased or decreased based on the indexes published by the bank. Therefore, including the contract wording establishing the cost will be adjusted based on the indexes will minimize the future challenge of currency devaluation.

In such cases, especially as the purchasing power of the birr is likely to fall sharply in the future, using Mexican experience is the best option to deal with currency devaluation and inflation. Specifically, imported construction materials should always be included in the contract document.

5.2. Recommendation

- A project data base for the construction sector that includes project information such as year built, size, currency rate, inflation rate, location, local market conditions, etc. should be properly established, which will help in estimating the future cost of projects and in cost planning.

- The contractor must be aware of the risk resulting from currency fluctuation and inflation. Thus, consider using cost-reimbursable contracts to minimize the risk of contractors following currency devaluation.

- The government should provide a law that allows contracts to be increased or decreased based on an index.

- Government policies can lead to increased construction materials prices. Plus, policy makers should consider devaluing the currency, which would have a huge impact on domestic contractors and the construction industry.

- The government should support domestic contractors to build their capacity to survive the effects of currency devaluation.

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Annex

Annex 1: Publishable Manuscript

Investigating the Effect of Currency Devaluation on Contractors: A Case Study on Selected Public Building Projects

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ABSTRACT

The National Bank of Ethiopia devalued Birr by 15% against United States Dollar (USD) in October 2017. Since then, the construction industry in Ethiopia has faced price volatility on construction materials. According to prior studies, the construction industry is influenced by currency devaluation, resulting in high inflation, volatile market pricing, and material shortages. This price increase causes contractors to fail in finishing their projects within the acceptable time and quality boundaries, as well as within the anticipated cost boundary. This delays their progress in every way. However, the extent of the impact on construction projects is not well-understood and needs to be studied more closely. Therefore, the main objective of this study is to investigate the effect of currency devaluation on contractors. In particular, this paper aims to determine the effect of currency devaluation on public building projects that were commenced before currency devaluation occurred. It also focuses on contributory trade of works induced by currency devaluation and minimizing the risk of economic loss

in construction projects due to currency devaluation for current and future occurrences. Based on a review of literature on the effect of currency devaluation on the Ethiopian construction sector and other countries' currency devaluation issues and measures, a case study research technique was utilized. Secondary data was obtained through document review. Analysis of data demonstrated the impact of the construction project, contributory trade, and strategies that the government should enforce to minimize the risk of devaluation on contractors. The result reviled that the construction cost of four public building projects in Addis Ababa increased by 18.12%, 17.72%, 16.51% and 13.94% because of the price escalation of construction materials tied to the currency devaluation of the Birr. Further, reinforced concrete work, wall and floor finishing work were found contributory to currency devaluation. The study concludes that compensating contractors who work for government projects and were adversely affected by the recent economic legislation adopted by the Government during 2017 to tackle the current crisis and adjusting the value of most contributory trade of works induced by currency devaluation to be increased or decreased based on an index minimizes the risk resulting from currency fluctuation for the future occurrence. On this basis, the government of Ethiopia should pass decisions that allow contracts to be increased or decreased, based on a price index.

Keywords: Currency Devaluation, Construction Materials, Construction Industry

INTRODUCTION

As per Shewangzaw, (2012) the Ethiopian government identified the construction industry as one of the three sectors of the economy, which needs special consideration to promote the country's economic development. On the other hand, the domestic construction industry in Ethiopia is still suffering from inadequate capital base, old & low levels of equipment availability and utilization, and limited experience and participation in the construction and consultation works.

However, the industry being one of the major contributors to the economy, it is subjected to cost and time overruns. several economic indicators can be used to evaluate and/or affect the overall cost of construction. This includes exchange rate of local currency, inflation rate, and interest rate charge on loans etc. (Oladipo, 2012).Foreign exchange and its inherent difficulties in the construction sector, as well as the requirement for local sourcing of building materials account for about 60% of total construction costs, which requires special attention (Oladipo, 2012).

Oladipo, (2012) stated that high construction prices have become a key sign of the construction industry's failure. It has appeared in low construction activities and abandoned projects have severe implications on the country's socio-economic and technological development. The need for building materials necessitates a significant amount of foreign investment, as well as the use of machinery and spare parts. As a result, when the country's currency causes a snag in the foreign exchange market, construction material producers are left out in the cold. According to Oladipo, (2012) currency devaluation in the past few years has adversely impacted construction materials prices.

In Ethiopian context, MoUDC, (2012) stated that the construction industry is highly dependent on imported materials. (ITE Build & Interiors n.d.) also added that up to 70% of all construction materials required in Ethiopia is imported. which makes is import dependent. Thus, currency devaluation causes imports to be costly and since the capacity of local construction material producers is very low, its effect is huge on the industry.

Generally, it is critical to have better knowledge of the impact of currency devaluation on public construction projects. In order to execute projects based on planned time, cost, and quality, especially when projects are scheduled to be executed without taking into account the country's uncertain risk and not including the possibility of price adjustment in the contract. In such a scenario, the contractors should have included a 3 to 5% risk allowance to overcome this situation, but if they do, they will lose their bid. Therefore, its impact affects project owners, contractors, and the supply chain.

The research's main objective is originated from understanding of currency devaluation relationship between inflation and price escalation of construction materials. In particular, this paper aims at addressing the effect of currency devaluation on public building projects and ways to minimize it.

Inflationary Impact of Devaluation

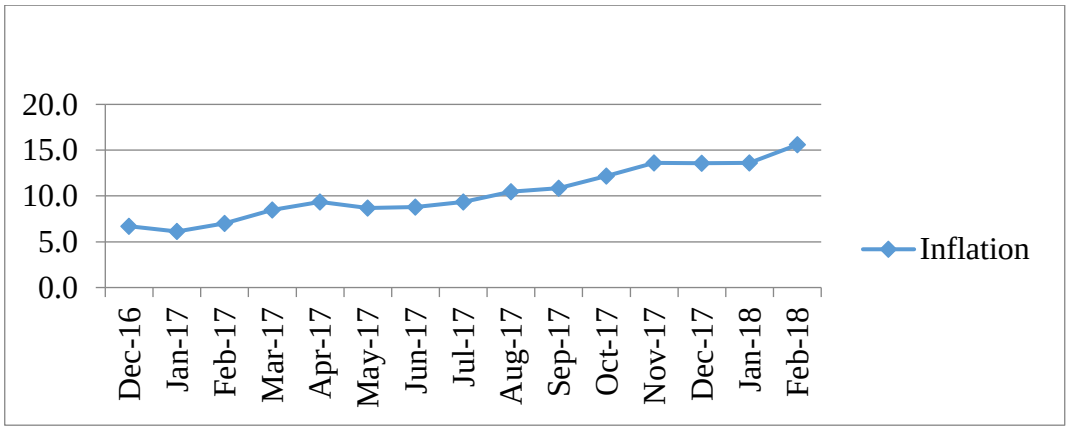
Inherently, currency devaluation causes inflation (Moges, 2004). Inflation is defined as a general increase in the prices of goods and services in an economy over some period of time. According to Moges, (*ibid*), the influence on domestic pricing is communicated both directly through higher import costs (end user products, gasoline, raw materials, and spare parts) and indirectly through increased

demand from the tradable sector. As per Zewde, (2018) the inflationary impact of depreciation is complemented and exacerbated by output contraction.

Because of the nature of the process and the rate of return for work done on construction projects, the impact of inflation can lead contractors to lose money and project owners to incur greater costs. Furthermore, owing to the causes that create project delays, the building project would expose the danger of inflationary cost rises (Zewde, 2018).

According to experience from developing countries, exchange rate depreciation is a possible source of inflation in Sierra Leone (Labata, 2019). The author also argued that there is also a strong and significant relationship between currency rate fluctuations and inflation in Uganda.

As per Labata, (2019) inflation is defined as a rise in the total price level of the economy. The government's principal goal is to achieve a stable macroeconomic situation in order to maximize societal welfare. This goal necessitates maintaining a reasonable amount of pricing stability. But the following figure shows that inflation rate in Ethiopia is not stable.



Source: Central Statistics Agency

Figure 1- Monthly inflation performances in Ethiopia from (Dec 2016 to Feb 2018)

The above figure shows the devaluation of the official exchange rate also added upward pressure on the rate of general inflation in Ethiopia.

The concept of Devaluation

A decline in the exchange rate or value of a country's currency in terms of foreign currency is referred to as devaluation. The government devalues currencies to lower the cost of exporting to the foreign market. It is seen as a way to boost a country's competitiveness. It increases the attractiveness of domestically produced items overseas while decreasing the attractiveness of foreign goods at home. This shifts the attractiveness of traded goods, causing the number of exports to rise while imports fall, resulting in an improvement in the trade balance (Krugman, 1999).

Overview of Devaluation in Ethiopia

The following sub section represents the different devaluation and revaluation periods of Ethiopian birr per USD.

Table 1- Continuous devaluation and revaluation of Ethiopian Birr per USD

Devaluation and revaluation years	Birr/USD	Devaluation & revaluation in %
1945	2.48	
1964	2.50	Devaluated by 0.8%
1971	2.30	Revalued by 8.75 %
1973	2.07	Revalued by 10 %
1992	5	Devaluated by 142 %
2010/11	From 13.63 to 16.35	Devaluated by 19.95 %
2017	From 23.4 to 26.91	Devaluated by 15 %

Negative effect of devaluation in construction projects

Reduction in Government Construction Project

The government is the largest source of building projects, and with the present currency devaluation, the government's capital spending on construction projects will undoubtedly decrease. This will affect all levels of government, from the federal to the state and municipal. As a result, the construction

industry's projected contribution to GDP will always decline as fewer building projects are commissioned (Vendors, 2016).

As per MUDC, (2020) due to the currency devaluation of our country over the past four years, lack of foreign exchange, and occasional security crisis, have led to a focus on major projects undertaken to improve inflation in the country, reduce new construction projects, and contractors not being able to complete the projects they have in hand.

Domination of major projects by foreign contractors in the country

As per Habcon consult, (2018) the contract execution practice has favored foreign contractors rather than domestic ones, protecting foreign contractors from any inflation (devaluation risk) and exchange rate fluctuations, as the contract for the main part of the work is designed to operate in a stable currency (such as the US Dollar, Euro etc.). The contract with foreign contractors is typically priced in Birr, similar to the contract with domestic contractors. However, the agreement with foreign contractors includes a condition to effect payment in the foreign currency of their choice by converting the Birr value at a fixed exchange rate that prevails 28 days prior to the bid submission date. As a result, foreign contractors will dominate the sector, forcing domestic contractors to reduce their market share.

The United Contractors Association's (2018) study shows that over the last 25 years, Ethiopia has spent more than 1.3 trillion birr (52 billion birr annually) on infrastructure construction. Thus, it has made a significant contribution to national growth and job creation. The share of local companies in this regard is shown in the table as follows.

Table 2- Involvement of domestic contractors

No	Major works	The project costs /billions of birrs	The role of domestic contractors in%
1	Roads	3	40.1%
2	Energy	4	1%
3	Rail way	2	1.5%
4	Telecommunication	8	1%

5	High-rise buildings	4	6.95%
6	Industry parks	6	3%

Source: ministry of urban development and construction works (MUDC)

As per MUDC, (2020) over the past few years, more than 40% of the projects have been implemented by international organizations. Local construction companies and individuals with limited capacity and skills are less involved.

Devaluation vs. Construction industry of Ethiopia

Leads to Price escalation in the construction industry

As per Tarekegn, (2017) if contractual services or other project components are being acquired, the exchange rate is very important. If exchange rates rise above the amount expected by the project sponsor and the firms delivering the services, the project's cost may rise. According to his argument, a study conducted in Nigeria discovered that, approximately 50% of the building materials and components incorporated into construction or parts of the materials ingredients required for the manufacture of the materials are sourced from abroad, bringing to light the issue of foreign exchange and its inherent problems in the construction industry, as well as the need for local sourcing of building materials.

Currency devaluation raises the cost of imported goods and raw materials. According to the Gebregziabher, (2018) report, Ethiopia would import such commodities whether they are expensive or inexpensive, since they are necessary and not a luxury item. Because most building materials are imported, and the country's primary imported materials are construction materials, this has a significant impact on the construction sector (Zewde, 2018). Also, Labata, (2019) found following the currency devaluation of the Birr, Ethiopian imports increased as well. This might be because Ethiopia imports strategic (vital/necessary) goods that are difficult to substitute with local commodities.

After the exchange rate adjustment in October 2017, the reinforcing market was the first to respond. Contractors have temporarily halted work in several areas, while major and small-scale companies have stalled because they can’t function without re-bar. Just one day after the devaluation, the price of re-bar increased sharply, ranging from 12 Br to 86 Br depending on the grade. Following the devaluation,

the price of 12m long re-bar with an 8mm thickness has risen to 138 Br. (Gebregziabher, 2018). On the other hand, a shortage of supply and increased product prices have caused a lot of problems in the economy since it plays a vital part in infrastructure development, as well as the destruction of both small and large enterprises and the lives of people who rely on it.

Table 3- Different reinforcement bar price increment prior to devaluation and post devaluation

Diameter	Unit	Sep2017	Oct 2017	May 2018	Oct 2018	Price difference
10	Kg	27.53	29.20	42.54	49	78%
12	Kg	24.76	27.30	49.70	49.71	101%
14	Kg	22.68	26.81	32.67	49.08	116%
16	Kg	24.54	27.07	42.59	49.70	102%
20	Kg	23.53	29.01	42.66	49.06	108%
24	Kg	24.60	31.25	42.60	48.99	99%
28	Kg	24.36	28.01	58.22	58.23	139%
Average price diff						106%

PROBLEM STATEMENT

National Bank of Ethiopia (NBE) declared a devaluation of the national currency on October 10, 2017, making imported products more costly in domestic markets. As a result, new orders for imports, as well as those that have already been imported and are presently in stock, saw immediate price increases due to the rate of devaluation. Unsurprisingly, in one way or the other, devaluation activates an upward inflationary pressure since the Ethiopian construction industry is reliant on foreign import, which will result in higher construction prices (Dil Tour & Travel, 2017).

Typically, huge number of building projects in Ethiopia have inefficiencies such as high construction input costs due to import fees and high foreign exchange rates, necessitating more investment in the private and governmental sectors (Alliance Experts, n.d.).

According to Yigezu, (2008) the Ethiopian construction industry is experiencing market price fluctuation, variably arising from sharp price increments, leading contractors to failure in completing their projects within an acceptable boundary of time and quality for the client and failing to complete them within the planned cost boundary. This hinders their progress in all aspects.

Regmi, (2017) stated contractors are mainly involved in diversified activities that are directly affected by existing market situation. In this respect, the overall business environment comes into picture, affecting contractors in many aspects; performance and capacity being the crucial ones.

EEA (2008) reported the majority of construction contractors (92.7%) were low-grade contractors (5 to 10) with an annual construction capacity of only 5 million and less, while 5.2% of contractors were grade 3 to 4 with an annual capacity of between 5 million and 15 million. The rest (2.1%) were grade 1 &-2 contractors with an annual construction capacity above 15 million birrs. This indicates that there are very few high-capacity contractors in the country. This appeal shows the necessity to strengthen the financial, technical & managerial capabilities of domestic contractors to enable them and become competitive in the market. However, due to currency devaluation, energy expended on capacity building of domestic contractors is wasted (Habcon Consult, 2018). Contractor capability issues have been highlighted as the most common building construction obstacles in the sector (Anshebo, 2017).

According to Vendors, (2016) due to local currency devaluation, there is a high cost of housing and properties as a result of the high cost of materials and high cost of production. To stay profitable, construction companies go beyond these additional costs incurred by the market.

Government policies, insufficient funds, donor shortages of foreign exchange, inappropriate contract terms, political priorities, poverty, socio-cultural conditions, corruption, low institutional & human capacity and occurrence of unforeseen events have been identified as major factors contributing to poor project performance in developing countries (Yimam, et al , 2011).

As per Bekele, (2018) report chemical and building materials exports have been hindered by the fluctuating foreign currency shortage. There are numerous problems confronting the chemical and construction inputs production industry. For example, a lack of foreign currency, raw materials and inconsistent power supply are some of the key variables affecting the sector's productivity.

Yigezu, (2008) stated as a contractor is the main stakeholder executing a project, they are first to face the problems and challenges in their operations within the construction industry. Physical resources (Materials and Machinery), labor, cash, and information are the key resource elements that must be addressed in the building of a project. Devaluation unwaveringly affects the contractor.

Labata, (2019) Wrote the price level in the country is raised as a result of devaluation, which accordingly increases the rate of inflation. The effects of inflation can lead to loss of profit for contractors and higher cost overrun to project owners. Furthermore, a construction project will expose the risk of inflationary cost increases due to the factors which cause project delays. There are limited empirical studies and articles that have been undertaken regarding currency devaluation on public construction projects. Research depicting the basic effect of devaluation is another aspect to be considered.

This paper will try to fill the gap in the literature review by observing other countries approach that were adversely affected by recent economic legislation. It will look in depth at how these economic decisions created a financial imbalance in the construction, supply and public service contracts. A case study will be used to illustrate the challenges or barriers that construction projects faced with the 2017 devaluation of the birr. Finally, it analyzes the impact on construction projects by using price escalation of construction material inputs, contributory trade of works induced by currency devaluation, and discusses the approaches that can be used to minimize the risk of economic loss in construction projects resulting from devaluation.

Therefore, this study investigates the impact of currency devaluation on construction projects and examines whether project implementation process addresses the impact of currency devaluation. The research is needed to identify methods and prevent such incidents from happening in the future.

Objectives of the study

General objective

The major objective of this study is to investigate the effect of devaluation on contractors by using a case study on selected public building projects.

Specific objectives

- Identify the effects of currency devaluation on public building projects by using the price change of construction materials.
- Identify the most contributory trade of works induced by currency devaluation in public buildings.
- Identify methods to minimize current situation and mitigate long-run (future) occurrence to public buildings.

SCOPE

Due to limited resources (finance and time), the scope of the study is limited only to public building construction projects being executed in Addis Ababa. The study focuses on the effect of currency devaluation on construction projects and/or major construction works. Other specialized construction works like joinery and carpentry will not be covered under this study.

SIGNIFICANCE

The implications of the study on minimizing the effect of devaluation on contractors, specifically a case study on selected building projects, could have a negative impact on the construction industry. Rising costs for construction materials, rebar, fuel, etc. have resulted in a sharp rise in the price of construction materials and delays in projects. However, reducing this problem and its impact on contractors has not been studied in depth. Therefore, this study is expected to solve problems related to currency devaluation for current situation and future occurrence.

Overall, this study will have a significant impact on the value of the exchange rate management system. It is necessary that the country's policymakers and government entities take major corrective actions to address the repercussions of the currency devaluation crisis on the industry.

METHODOLOGICAL APPROACH

the research methodology explains the several processes that the researchers used when studying the research questions in order to address the research problem methodically and make the research useful. This chapter will go through the research paradigm, research type, approach, methodology, data gathering techniques, and how to analyze them will be discussed.

Research approach: The research used a quantitative with less qualitative approach to address the research questions. The data for the study is obtained mainly from secondary sources. The prices of construction materials were collected from the central statistics agency (CSA), national construction magazine published journals, while the contract documents and bill of quantity (BOQ) were collected from case projects. The researcher follows an explanatory, quantitative with less qualitative method of research design to investigate how the effect of currency devaluation will be minimized.

Source of data: This study used secondary data to collect essential information concerning the effect of currency devaluation on contractors and to understand the contributory trade of works induced by currency devaluation. The source of the data for this study has been selected from public building projects in which contracts were signed before and after currency devaluation, the national construction magazine and the central statistics agency. This source delivers contract documents and construction materials price lists for the pre and post devaluation period. The particular reason for the circumstances is data reliability, and it tries to show the exact impact of currency devaluation.

Data Source Selection /Sampling technique: Etikan, Musa, & Alkassim, (2015) stated that in purposive sampling the researcher has something in mind and cases to suit the purpose of the study and each case will provide unique and rich information.

On this study, to understand the impact of devaluation and to identify contributory trade induced by currency devaluation, a maximum variation purposive sampling (Heterogeneous sampling) is used. And the sample size it determined by data saturation and not by numerical power analysis is used. The selection criteria for sample case building construction projects are stated below.

- Public building projects in which the contracts were signed prior to the 2017 currency devaluation period has been selected. Four building projects have been selected From Federal

Government Building Projects and Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector. These projects were started in different times and found in different construction phases.

- Public building projects pre and post devaluation period was chosen to demonstrate the contributory trade of works influenced by currency devaluation. Ten building projects have been selected From Federal Government Building Projects and Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector.
- Only domestic contractors were incorporated in this research since they are the first more exposed to the impact of devaluation, and this gives a good understanding of the effects devaluation.

Data source size: The concept of data saturation was used to determine the appropriate data size. This study used multiple case studies as a data source to allow the researcher to have deep knowledge and to construct the overall study stronger. Purposively, projects which were signed and started their progress before currency devaluation helps to investigate the effects of currency devaluation. Similarly, projects which were signed before and after currency devaluation is incorporated to identify contributory trade of works induced by currency devaluation.

Data analysis: The price of construction materials was gathered from the central statistics agency and the national construction magazine. The national construction magazine publishes the price of construction materials on a monthly basis. Besides, document review was analyzed from selected public building projects. From these sources, the researcher has been compiled monthly price data; the data from contract documents was collected and evaluated to weigh the effect of devaluation on the price of construction materials and to investigate contributory trade due to currency devaluation. The data analysis uses simple averages, percentages, tables and charts. Based on the results of the analysis, conclusions and recommendations will be made.

RESULT AND DISCUSSION

Three inquiries have been developed to answer the questions being studied. The data was obtained from selected ten (10) public building construction projects in Addis Ababa which were constructed and

supervised by different contractors and consultants and had project costs of more than 124 million birr, including contract documents, construction materials prices from national construction magazines, and the central statistics agency. The study uses a price adjustment formula to determine the adjustment factor, price of construction materials, weighting factor, simple average, and percentage to analyze the data. Along with the line, tables and charts will be utilized for ease of understanding. Finally, there will be a discussion on minimizing the effect of currency devaluation to protect domestic contractors from risks that arise as a result of devaluation.

Table 6- Project Description

No	Project Name	Contract Signed date	Project duration	Project cost	Project status
1	Federal police commission project	17-May 2016	2 years	124,892,786.39	Under construction (finishing)
2	4B+G+16 Government Communication affairs Office complex	12-Aug2016	2 years	1,176,066,708.98	Completed
3	School of Journalism and Mass Communication Project	18-May 2017	2.5 years	813,827,805.95	Under construction
4	Construction of Office Building Work (Geophysics)	18-May 2017	1 year	217,068,248.14	Under construction
5	Apartment and office building for Ministry of Foreign affairs	12-Jan 2018	2.5 years	1,135,490,490.91	Completed
6	Ethiopian civil aviation authority head quarter building	20- Dec 2018	2 years	292,566,405.69	Completed
7	New professional theater building	6- Mar 2019	1.5 years	1,496,919.095.48	Completed

8	Construction of national meteorology agency building Lot 1	13-Feb 2020	1year	696,469,302.44	Under construction
9	Construction of federal documents authentication and registration head quarter office building	Sep 2020	1.5 years	1,649,471,613.86	Under construction
10	Construction of national meteorology agency building Lot 2	17-Sep 2020	1year	391,684,569.89	Under construction

Effect of currency devaluation on public building projects

this section will attempt to show the effect of currency devaluation on a given project by using construction materials' monthly price changes and price adjustment formulas to calculate the material price escalation of a given project. This section covers four public building projects where contracts were awarded before the currency devaluation arrangement. Major construction projects such as concrete work, electrical installation, finishing work, aluminum work, plastering and pointing, masonry work, and structural steel work will be used to demonstrate the impact of the currency devaluation that occurred in October 2017.Thus, inflation can be calculated for materials, labor, fuel, and equipment in line with the following formula.

$$PN = NV + A\frac{Mn}{Mo} + B\frac{Ln}{Lo} + C\frac{Fn}{Fo} + D\frac{En}{Eo} \text{ etc.}$$

In this case the price adjustment formula for material element will be calculated by

$$PN = NV + C\frac{Cn}{Co} + R\frac{Rn}{Ro}$$

over view of projects used for this section

No	Project name	Employer	Consultant	Contractor	Contract signing date	Contract amount
1	School of Journalism and Mass Communication Project	Addis Ababa University	Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector	SATCON Construction PLC.	May-17	813,827,805.95
2	Federal Police Commission Project	Federal Police Commission	Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector	FE Construction PLC.	17-May-16	124,892,786.39
3	Construction of Office Building Work(Geophysics)	Addis Ababa University	Ethiopian Construction Design & Supervision Works Corporation Building and Urban Design & Supervision Works Sector	FE Construction PLC.	18-May-17	217,068,248.14
4	4B+G+16 Government Communication affairs Office complex	FDRE, Ministry of Urban &Housing -Federal Government Buildings Construction& Administration Bureau	Yohannes Abbay Consulting Architects &Engineers	Tekleberhan Ambaye Construction PLC	12-Aug-16	1,176,066,708.98

Comparison and summary of four case study projects result

As a literature review, the thesis discusses the effect of currency devaluation on the construction projects and as analysis, it discusses and explains how much currency devaluation affects the original cost of the construction projects on materials input.

From the above four case study projects, it was learned that major components of building construction work, such as concrete, finishing, steel and metal work, and masonry and block work, have been shown to be significantly triggered by currency devaluation. Therefore, the Federal Police Commission Project shows an 18.12% increment in project cost due to currency devaluation, which is the highest inflation total pressure of all case study projects.

Accordingly, in the case of the 4B+G+16 Government Communication Affairs Office Complex and Federal Police Commission projects, concrete work shows an average increase of 44% and 42% respectively. Whereas 33% and 39% of the average price increment of concrete work is recognized in the case of construction of office buildings (Geophysics) and School of Journalism and Mass Communication Projects, respectively, the increase in the price of construction inputs caused by currency devaluation, concrete work takes the lion's share, which shows the highest price increment among other work items. Similarly, structural steel work shows an average increase of 28% and 29.7% in the case of the School of Journalism and Mass Communication and Federal Police Commission

Projects. Whereas in the case of construction of office buildings (Geophysics) and 4B+G+16 Government Communication Affairs Office Complex projects show an average increase of 21% and 22%, finishing work took 3rd place to show an average increase of 6.33% and 8.33%, respectively. In the case of the school of journalism and mass communication, the federal police commission, the construction of office buildings (Geophysics) and the 4B+G+16 Government Communication Affairs Office Complex projects show a rise of 6%respectively.

Therefore, it confirms that currency devaluation has a direct impact on the implementation of construction projects in relation to executing contracts signed prior to the devaluation. And it led to an increase in the construction materials prices on building projects, which had the effect of increasing the project cost and disrupting the contract price by 16.51%, 18.12%, 13.94% and 17.72% respectively. As stipulated in the literature review, the price escalation of construction materials, which is driven by currency devaluation, leads to an increase in the project cost.

Contributory Trade of Works due to Currency Devaluation

To determine the contributory trade of works induced by currency devaluation, ten public building projects were reviewed for pre and post devaluation periods. The price of construction works in different time periods was examined in depth to identify which trades are vulnerable to currency devaluation.

Tangible increment in the price of construction works discussed above shows exactly how the cost of trade has considerably increased resulting from the execution of the currency devaluation. Therefore, most of the trades discussed above show price increment immediately after the execution of the currency devaluation but then show price decline after the devaluation. Accordingly, reinforced concrete work shows gradual increment throughout the period exhibited by ten projects. Similarly, wall and floor finishing work were found contributory to currency devaluation based on case projects.

Minimizing effect of currency devaluation for current situation and long run occurrence

In connection with inflation in the country during the fiscal year 2010, which led to an increase in the cost of construction materials, has caused significant losses to domestic contractors and the construction industry. Therefore, it is essential for the government to take action that will overwhelm the effect of currency devaluation realized on the above case study projects.

In the event of such problems, the way our country or other countries resolve them is through the Ex-Gratia claim process, which makes them uniquely determined by the government. In this manner, the ministry of construction and urban development requests solutions to the increase in construction input costs caused by currency devaluation, according to the data provided by the ministry of urban development and construction. The ministry of finance issued guidelines for the price fluctuation of cement rebar and ceramic inputs since some procurement companies do not include the possibility of price adjustments in the contract, plus other procuring entities include provision for price adjustments in the contract, but a request for price adjustment from contractors failed to respond immediately.

Therefore, in order to solve the problem in the sector in a sustainable way, it is expected that procurement and property management will be amended. In accordance with the federal government procurement and property management, procurement and implementation directive as well as the construction bid procurement regulations, considering the provisions, a price adjustment may be made.

- If it is not due to poor performance of the contractors or inability to carry out their construction work on time according to the contract, a contract document stating that price adjustments may be made in accordance with article 16/4 and article 16/7/3 of the procurement implementation guidelines should be included in the bidders' guidelines and special contract conditions.
- According to article 16/14/3 of the implementation directive, the list of construction inputs to be adjusted, including cement, re-bar, and ceramic inputs, should be adjusted and pre-determined by including the bid document and contract document.
- Procurement implementation guidelines for request of price adjustment from contractors by applying the price adjustment in accordance with the details of the bidding document and the price adjustment formula and timely response as well.
- For the construction contractors who have previously signed the contract with out and don't have a price adjustment clause, it is necessary to provide the **cement, re-bar, and ceramic** inputs in

accordance with the provisions of article 29/4 of the executive directive and the general conditions of the amendment provisions and adjust the price of the **remaining works** by following the adjustment formula.

Therefore, ministry of finance acts through passing instructions in order to avoid the harm that can be in the construction industry, especially domestic contractors but these guidelines will be used only for the price adjustment of remaining works it doesn't allow to compensate contracts which were executed.

Therefore, to minimize the current situation induced thru currency devaluation by considering and changing **Egypt's devaluation issues and measures** in our context to compensate contractors who work for government projects and were adversely affected by the recent currency devaluation adopted by the Government during 2010.

Compensation criteria should include

- The price adjustment will only apply to projects signed before the price change on October 1st, 2010 E.C and only to projects that can be assured they will not end due to inflation caused by currency devaluation. It also applies to projects that can ensure when a time extension is needed, it will be accommodated on either a contract or administrative basis.

- The price adjustment is calculated for cement, reinforcement bar, RHS, including aluminum, granite, ceramic, and other wall and floor finishing inputs, for concrete steel and metal, and finishing work only.

- The inflation adjustment is provided based on the formula and a reliable source of prices.

PAI= A+b (CTc/CTb) +c (RBc/RBb) +d (Sc/Sb) +e (GR,CRc/GR,CRb)

PAI= price adjustment index

A, b, c, d, e= price adjustment weightings for respective permitted construction materials and their sum shall be 1

CT=cement, RB= reinforcement bar, S= steel and metal, GR, CR= granite, ceramic and other wall and floor finishing materials

C and b =current and basic prices from reliable sources

In order minimize effect of currency devaluation for future occurrence adopting Mexico's public works and related services law that allows contracts to be increased or reduced, based on an index is necessary. Somehow the Ethiopian roads authority (ERA), which is part of the procurement of road projects, is better to implement price adjustment. The supply is well implemented by adjusting the values of three road construction inputs such as equipment, bitumen and reinforcement bar, based on an index of U.S bureau of labor statistics. As well the building construction sectors should exercise contracts to be increased or decreased based on an index by adjusting most contributory trade of works due to currency devaluation.

CONCLUSION

After the National Bank of Ethiopia officially devalued the value of the birr by 15% against the US dollar in October 2017, its consequences have been shown in the price of construction materials, which affects the performance of domestic contractors in relation to implementing contracts prior to the devaluation. A case study was done aimed at identifying the impact of currency devaluation on public building construction projects and demonstrating the trade of works which is contributory to currency devaluation. It also revealed how the effect of currency devaluation will be minimized for current and future occurrences. The results of the study showed that an increase in construction material prices persuaded by currency devaluation led to an increase in the project's cost by 18.12%, 17.72%, 16.51% and 13.94% based on the case projects. This leads the contractor going through a financial crisis resulting from devaluation. On the other hand, it has significantly delayed projects that had been intended to be finished. This situation will also affect directly the project and contractors, and indirectly suppliers.

From the analysis and discussion in this paper, reinforced concrete work and wall and floor finishing work were found to be contributory to currency devaluation since the construction industry is dependent on imported construction inputs. However, there's always a way out of every challenge if proper consideration is given. The study concludes that by using the approach of Egypt's and Mexico's currency devaluation issues and measures to minimize the current risk of currency devaluation, domestic contractors can be compensated based on the criteria discussed above for projects that are not

finished yet due to the high cost of construction inputs and are not considered in the agreed contract price.

Adopting Mexico's public works and related services law, which allows the contract amount to be increased or decreased based on the indexes published by the bank. Therefore, including the contract wording establishing the cost will be adjusted based on the indexes will minimize the future challenge of currency devaluation.

In such cases, especially as the purchasing power of the birr is likely to fall sharply in the future, using Mexican experience is the best option to deal with currency devaluation and inflation. Specifically, imported construction materials should always be included in the contract document.

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Annex 2: Price of cement between the period of Oct 2017 and Dec 2019

Cement	(Oct 2017) Tikmt 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Aug, 2018) nehase 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2019) Tikimt 2012	(Dec 2019) Tahisas 2012
Mesobo OPC	250	275	275	275	275	275	275	275	275	275	275
Messobo PPC	190	209	209	209	209	209	209	209	209	209	209
Muger OPC	270	300	300	300	300	300	300	300	300	300	300
Muger PPC	200	230	230	230	230	230	230	230	230	230	230
Derba OPC	265.65	277.15	277.15	277.15	277.15	277.15	277.15	277.15	277.15	277.15	277.15
Derba PPC	195.5	214.5	214.5	214.5	214.5	214.5	214.50	214.50	214.50	214.50	214.59
Average	228.525	250.94167	250.94167	250.94167	250.9416667	250.94167	250.94167	250.94167	250.941667	250.94167	250.95667
Cement											
	(Oct 2017) Tikmt 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Aug, 2018) nehase 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2019) Tikimt 2012	(Dec 2019) Tahisas 2012
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Avg. Price	228.53	250.94	250.94	250.94	250.94	250.94	250.94	250.94	250.94	250.94	250.96

Source: central statistics agency and national construction magazine

Annex 3: Price of reinforcement bar between the period of Oct 2017 and Dec 2019

Types of material	(Oct 2017) Tikmt 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Aug, 2018) nehase 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2019) Tikimt 2012	(Oct, 2019) Tikimt 2012
Reinforcement Bar											
Rebar Grade 40 Dia 8mm	41.18	74.44	72.86	69.69	64.94	63.36	58.60	61.77	61.14	58.60	55.44
Rebar Grade 40 Dia 10mm	30.82	59.20	58.39	55.14	51.09	50.28	47.04	47.85	48.66	46.71	44.60
Rebar Grade 40 Dia 12mm	22.52	45.99	38.48	42.24	41.30	40.36	38.48	39.89	44.58	38.48	36.61
Rebar Grade 40 Dia 14mm	19.51	39.60	39.01	38.42	36.06	35.46	33.40	32.51	37.83	33.10	31.92
Rebar Grade 40 Dia 16mm	17.03	34.05	33.26	32.87	31.68	31.28	29.50	29.70	33.06	30.09	27.72
Rebar Grade 40 Dia 20mm	13.58	27.37	28.38	27.57	25.34	24.94	23.52	24.02	26.36	23.92	22.30
Average	32.50	47.00	46.00	44.34	42.30	41.40	40.00	40.50	44.50	39.80	37.30
		Rebar									
	(Oct 2017) Tikmt 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Aug, 2018) nehase 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2019) Tikimt 2012	(Dec 2019) Tahisas 2012
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11
Avg. Price	23.50	47.00	46.00	44.34	42.30	41.40	40.00	40.50	44.50	39.80	37.30

Source: national construction magazine

Annex 4: Average prices of switches and sockets the period between Oct 2017 and May 2019

Swithces & Sockets					
	(Oct 2017) Tikmt 2010	(July 2018) hamle 2010	(Sep, 2018) meskerem 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011
	M1	M2	M3	M4	M5
Avg. Price	143.50	162.50	155.00	122.50	125.00

Annex 5: Price of marble tile the period between Oct 2017 and Dec 2019

	(Oct 2017) Tikmt 2010	(June 2018)sene 2010	(July 2018)hamle 2010	(Sep, 2018)meskerem 2011	(April, 2019))Miazia 2011	(Oct, 2019)Tikimt 2012	(Dec 2019)Tahisas 2012
2mm.thick marble	1550	1570	1650	1500	1600	1700	1800
3mm.thick welga marbel	1450	1740	1750	1700	1725	1850	1850
4mm.thick white marbel	1650	1790	1850	1750	1850	1850	1900
Avg. Price	1550	1700	1750	1650	1725	1800	1850
	Marble Tiles						
	(Oct 2017) Tikmt 2010	(June 2018)sene 2010	(July 2018)hamle 2010	(Sep, 2018)meskerem 2011	(April, 2019))Miazia 2011	(Oct, 2019)Tikimt 2012	(Dec 2019)Tahisas 2012
	M1	M2	M3	M4	M5	M6	M7
Avg. Price	1550	1700	1750	1650	1725	1800	1850

Annex 6: Average price of granite tiles the period between Oct 2017 and Dec 2019

Granite Tiles						
	(Oct 2017) Tikmt 2010	(June 2018)sene 2010	(July 2018)hamle 2010	(Sep, 2018)meskerem 2011	(Oct, 2019)Tikimt 2012	(Dec 2019)Tahisas 2012
	M1	M2	M3	M4	M5	M6
Avg. Price	1125	1200	1325	1250	1550	1550

Annex 7: Price of rectangular hollow section the period between Oct 2017 and Dec 2019

Types of material	(Oct 2017) Tikmt 2010	(Jan, 2018) Tirr 2010	(Feb 2018) Yekatit 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2019) Tikimt 2012	(Dec 2019) Tahisas 2012
Size 20*10*1 mm	220	160	140	120	200	150	130	180	190	195	195	190
Size 30*10*1 mm	135	200	170	170	240	250	165	210	205	210	210	210
Size 30*20*1.5mm	230	270	290	300	320	320	260	320	330	320	280	340
Size 30*20*2mm	270	320	380	410	420	420	390	420	410	410	430	430
Size 40*20*2mm	330	370	450	530	530	520	490	520	520	530	530	530
Size 40*20*2.5mm	400	420	510	610	630	650	550	630	610	610	630	630
Size 50*30*2mm	496	550	580	670	620	620	630	770	630	630	630	640
Size 50*30*2.5mm	480	620	670	890	750	750	760	840	740	740	760	760
Size 50*30*3mm	670	720	830	980	880	900	850	940	910	890	930	950
Size 60* 40*2mm	560	650	740	820	750	850	800	780	770	770	810	780
Size 60*40*2.5mm	670	750	920	950	850	1000	980	950	930	930	980	980
Size 60* 40*3mm	790	800	1540	1150	1000	1250	1180	1200	1180	1180	1250	1230
Size 70*50*2mm	660	980	910	950	1000	950	950	1080	930	970	980	950
Size 70*50*2.5mm	790	1300	1150	1050	1200	1250	1200	1180	1180	1230	1250	1230
Size 70*50*3mm	980	800	1300	1250	1450	1550	1500	1280	1410	1450	1450	1450
Size 80* 40*2mm	670	980	1200	950	1000	950	950	960	930	970	980	950
Size 80*40*2.5mm	780	1300	1350	1050	1200	1250	1200	1250	1180	1230	1250	1230
Size 80* 40*3mm	980	1350	1350	1250	1450	1550	1500	1480	1410	1450	1450	1450
Sizel00*60*2.5 mm	1100	1500	2200	1650	1800	1550	1700	1750	1700	1700	1800	1650
Size 100*60*3mm	1300	2200	2500	2100	2100	1800	2100	2100	1900	2050	2050	1950
Average	625.55	812	959	892.5	919.5	926.5	914.25	942	903.25	923.25	942.25	926.5
Rectangular Hollow Sections (RHS)												
	(Oct 2017) Tikmt 2010	(Jan, 2018) Tirr 2010	(Feb 2018) Yekatit 2010	(June 2018) sene 2010	(July 2018) hamle 2010	(Sep, 2018) meskerem 2011	(Nov, 2018) hidar 2011	(Feb 2019) yekatit 2011	(April, 2019) Miazia 2011	(May, 2019) Ginbot 2011	(Oct, 2019) Tikimt 2012	(Dec 2019) Tahisas 2012
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Avg. Price	625.55	812.00	959.00	892.50	919.50	926.50	914.25	942.00	903.25	923.25	942.25	926.5

Annex 8: Price of aluminum window the period between Oct 2017 and Nov 2019

Aluminum Window															
	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Oct-18	Nov-18	Dec-18	Nov-19
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15
Price	2700	2700	2700	2700	2700	2700	3000	3000	3000	3000	3000	3000	3000	3000	3000

Annex 9: Summaries of adjustable contract items of journalism & mass communication project

Summary of Adjustable Contract items of Journalism and Mass Communication project

1	**Total Contract Amount**	707,676,353.00	%
1.1	Concrete Work	230,445,057.00	33%
1.2	Masonry & Block work	19,932,673.00	3%
1.3	Plastering work	61,140,516.00	9%

NO	Description of Adjustable item	Unit	Rate	Weighting for Concrete Work		Weighting for Masonry & Block Work		Weighting for Plastering Work	
				Contract amount =	230,445,057.00	Contract amount =	19,932,673.00	Contract amount=	61,140,516.00
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight
2	Cement (C)	qtl	234.00	34,566,758.55	0.15	1,341,219.97	0.07	9,782,482.56	0.16
4	Re Bar (R)	kg	22.90	117,526,979.07	0.51	0.00	0.00	0.00	0.00
A	Total of Adjustable Items			152,093,737.62	0.66	1,341,219.97	0.07	9,782,482.56	0.16
B	Total of Non - Adjustable Items (NV)			78,351,319.38	0.34	18,591,453.03	0.93	51,358,033.44	0.84
	SUM			230,445,057.00	1.00	19,932,673.00	1.00	61,140,516.00	1.00

Annex 10: Summaries of adjustable contract items of journalism & mass communication project

Summary of Adjustable Contract items of Journalism and Mass Communication project			
1	**Total Contract Amount**	707,676,353.00	%
1.1	Floor &Wall finishing work ……..	81,089,828.00	11%
1.2	Structural Steel work ……	1,407,944.00	0.20%
1.3	Aluminum work ……..	68,177,888.00	9.63%

NO	Description of Adjustable item	Unit	Rate	Weighting for Floor &Wall finishing Work		Weighting for Structural steel Work		Weighting for Aluminum Work	
				Contract amount =	**81,089,828.00**	Contract amount =	**1,407,944.00**	Contract amount=	**68,177,888.00**
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight
1	Cement (C)	qtl	234.00	932,533.02	0.0115	0.00	0.00	0.00	0.00
2	Granite	m^2	1200.00	28,567,946.40	0.3523	0.00	0.00	0.00	0.00
3	RHS	kg	68.00	0.00	0.00	944,996.00	0.6712	0.00	0.00
4	Aluminum window	No	2400.00	0.00	0.00	0.00	0.00	36,900,363.00	0.5412
A	Total of Adjustable Items			29,500,479.43	0.3638	944,996.00	0.6712	36,900,363.00	0.5412
B	Total of Non - Adjustable Items (NV)			51,589,348.57	0.6362	462,948.00	0.328	31,277,525.00	0.4588
	SUM			81,089,828.00	1.00	1,407,944.00	1.00	68,177,888.00	1.00

Annex 11: Summaries of adjustable contract items of Federal police Commission project

Summary of Adjustable Contract items of Federal police commission project			
1	**Total Contract**	108,602,422.95	%
1.1	Concrete Work …….	29,534,525.00	27.20%
1.2	Masonry & Block work ……	7,222,350.00	6.65%
1.3	Plastering work ……..	5,415,390.00	4.99%

NO	Description of Adjustable item	Unit	Rate	Weighting for Concrete Work		Weighting for Masonry & Block Work		Weighting for Plastering Work	
				Contract amount =	29,534,525.00	Contract amount =	7,222,350.00	Contract amount=	5,415,390.00
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight
2	Cement (C)	qtl	234.00	4,629,358.59	0.1568	2,022,258.00	0.28	1,335,670.30	0.25
4	Re Bar (R)	kg	33.00	16,455,378.06	0.5571	0.00	0.00	0.00	0.00
A	Total of Adjustable Items			21,084,736.65	0.7139	2,022,258.00	0.28	1,335,670.30	0.25
B	Total of Non - Adjustable Items (NV)			8,449,788.35	0.2861	5,200,092.00	0.72	4,079,719.70	0.75
	SUM			29,534,525.00	1.00	7,222,350.00	1.00	5,415,390.00	1.00

Annex 12: Summaries of adjustable contract items of Federal police Commission project

Summary of Adjustable Contract items of Federal police commission project			
1	**Total Contract**	108,602,422.95	%
1.1	Floor &Wall finishing work ……	10,604,130.00	9.76%
1.2	Structural Steel work ……	695,400.00	0.64%
1.3	Aluminum work ……	10,237,313.60	9.43%

NO	Description of Adjustable item	Unit	Rate	Weighting for Floor &Wall finishing Work		Weighting for Structural steel Work		Weighting for Aluminum Work	
				Contract amount =	10,604,130.00	Contract amount =	695,400.00	Contract amount=	10,237,313.60
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight
1	Cement (C)	qtl	234.00	371,144.55	0.035	0.00	0.00	0.00	0.00
2	Granite	m^2	1200.00	4,718,837.85	0.445	0.00	0.00	0.00	0.00
3	RHS	kg	50.00	0.00	0.00	486,780.00	0.7	0.00	0.00
4	Aluminum window	No	2400.00	0.00	0.00	0.00	0.00	4,197,298.58	0.41
A	Total of Adjustable Items			5,089,982.40	0.48	486,780.00	0.7	4,197,298.58	0.41
B	Total of Non - Adjustable Items (NV)			5,514,147.60	0.52	208,620.00	0.3	6,040,015.02	0.59
	SUM			10,604,130.00	1.00	695,400.00	1.00	10,237,313.60	1.00

Annex 13: Summaries of adjustable contract items of Construction of Office Building Work (Geophysics)

Summary of Adjustable Contract items of Construction of Office Building Work (Geophysics)											
1	**Total Contract**			188,754,998.38	%						
1.1	Concrete Work …….			60,933,220.00	32.28%						
1.2	Masonry & Block work ……			9,080,450.00	4.81%						
1.3	Plastering work ……..			15,663,625.00	8.30%						
NO	Description of Adjustable item	Unit	Rate	**Weighting for Concrete Work**		**Weighting for Masonry & Block Work**		**Weighting for Plastering Work**			
				Contract amount =	60,933,220.00	Contract amount =	9,080,450.00	Contract amount=	15,663,625.00		
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight		
2	Cement (C)	qtl	234.00	11,577,311.80	0.19	2,451,721.50	0.27	3,289,361.25	0.21		
4	Re Bar (R)	kg	36.00	25,591,952.40	0.42	0.00	0.00	0.00	0.00		
A	Total of Adjustable Items			37,169,264.20	0.61	2,451,721.50	0.27	3,289,361.25	0.21		
B	Total of Non - Adjustable Items (NV)			23,763,955.80	0.39	6,628,728.50	0.73	12,374,263.75	0.79		
	SUM			60,933,220.00	1.00	9,080,450.00	1.00	15,663,625.00	1.00		

Annex 14: Summaries of adjustable contract items of Construction of Office Building Work (Geophysics)

Summary of Adjustable Contract items of Construction of Office Building Work (Geophysics)											
1	**Total Contract**			188,754,998.38	%						
1.1	Floor &Wall finishing work ……			15,538,400.00	8.23%						
1.2	Structural Steel work ……			1,407,944.00	0.75%						
1.3	Aluminum work ……			9,207,212.85	4.88%						
NO	Description of Adjustable item	Unit	Rate	**Weighting for Floor &Wall finishing Work**		**Weighting for Structural steel Work**		**Weighting for Aluminum Work**			
				Contract amount =	15,538,400.00	Contract amount =	1,407,944.00	Contract amount=	9,207,212.85		
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight		
1	Cement (C)	qtl	234.00	621,536.00	0.04	0.00	0.00	0.00	0.00		
2	Marble	m^2	1102.50	7,769,200.00	0.5	0.00	0.00	0.00	0.00		
3	RHS	kg	66.00	0.00	0.00	689,892.56	0.49	0.00	0.00		
4	Aluminum window	No	2400.00	0.00	0.00	0.00	0.00	6,076,760.48	0.66		
A	Total of Adjustable Items			8,390,736.00	0.54	689,892.56	0.49	6,076,760.48	0.66		
B	Total of Non - Adjustable Items (NV)			7,147,664.00	0.46	718,051.44	0.51	3,130,452.37	0.34		
	SUM			15,538,400.00	1.00	1,407,944.00	1.00	9,207,212.85	1.00		

Annex 15: Summaries of adjustable contract items of 4B+G+16 Government Communication Affairs Office

Summary of Adjustable Contract items of 4B+G+16 Government Communication Affairs Office			
1	**Total Contract**	1,022,666,703.46	%
1.1	Concrete Work …….	347,706,679.18	34.01%
1.2	Masonry & Block work ……	21,353,532.11	2.09%
1.3	Plastering work ……..	11,405,685.00	1.12%

NO	Description of Adjustable item	Unit	Rate	Weighting for Concrete Work		Weighting for Masonry & Block Work		Weighting for Plastering Work	
				Contract amount =	347,706,679.18	Contract amount =	21,353,532.11	Contract amount=	11,405,685.00
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight
2	Cement (C)	qtl	234.00	66,064,269.04	0.19	7,046,665.60	0.33	2,965,478.10	0.26
4	Re Bar (R)	kg	40.00	201,669,873.92	0.58	0.00	0.00	0.00	0.00
A	Total of Adjustable Items			267,734,142.97	0.77	7,046,665.60	0.33	2,965,478.10	0.26
B	Total of Non - Adjustable Items (NV)			79,972,536.21	0.23	14,306,866.51	0.67	8,440,206.90	0.74
	SUM			347,706,679.18	1.00	21,353,532.11	1.00	11,405,685.00	1.00

Annex 16: Summaries of adjustable contract items of 4B+G+16 Government Communication Affairs Office

Summary of Adjustable Contract items of 4B+G+16 Government Communication Affairs Office			
1	**Total Contract**	1,022,666,703.46	%
1.1	Floor &Wall finishing work ……	79,210,691.94	7.75%
1.2	Structural Steel work ……	2,305,747.00	0.23%
1.3	Aluminum work ……	5,594,151.25	0.55%

NO	Description of Adjustable item	Unit	Rate	Weighting for Floor &Wall finishing Work		Weighting for Structural steel Work		Weighting for Aluminum Work	
				Contract amount =	79,210,691.94	Contract amount =	2,305,747.00	Contract amount=	5,594,151.25
				Material cost of items (Birr)	weight	Material cost of items (Birr)	weight	Material cost of items (Birr)	weight
1	Cement (C)	qtl	234.00	6,336,855.36	0.08	0.00	0.00	0.00	0.00
2	Granite	m^2	1200.00	20,594,779.90	0.26	0.00	0.00	0.00	0.00
3	RHS	kg	58.00	0.00	0.00	1,198,988.44	0.52	0.00	0.00
4	Aluminum window	No	2400.00	0.00	0.00	0.00	0.00	2,573,309.58	0.46
A	Total of Adjustable Items			26,931,635.26	0.34	1,198,988.44	0.52	2,573,309.58	0.46
B	Total of Non - Adjustable Items (NV)			52,279,056.68	0.66	1,106,758.56	0.48	3,020,841.68	0.54
	SUM			79,210,691.94	1.00	2,305,747.00	1.00	5,594,151.25	1.00

Annex 17: percentage of share of components in different buildings

	Percentage share of components in different buildings					
Item	Descripiton	school of Journalism and Mass Communication Project	Federal police commission project	Construction of Office Building Work (Geophysics)	4B+G+16 Government Communication Affairs Office	Average Share of All Building Components
1	Excavation and Earth work	3.00%	6.97%	4.72%	4.00%	4.67%
2	Concrete Works	33.00%	27.20%	32.28%	34%	32%
3	Masonry & Block Works	2.82%	6.65%	4.81%	2.09%	4.09%
4	Roofing and Water proofing	3.00%	2.25%	3.28%	3.49%	3.01%
5	Carpentry and Joinery	3.87%	3.83%	4.06%	4.38%	4.04%
6	Structural Steel works	0.20%	0.67%	0.75%	0.23%	0.46%
7	Metal works	12.30%	6.44%	9.77%	8.67%	9.30%
8	Finishing Works	20.10%	14.75%	16.53%	9.00%	15.10%
9	Glazing	0.88%	0.20%	1.09%	3.50%	1.42%
10	Painting	1.20%	0.88%	2.86%	4.18%	2.28%
11	Sanitary Installation	5.10%	4.73%	4.20%	5.36%	4.85%
12	Ellectricall Installation	14.53%	25.43%	15.65%	21.10%	19.18%
	TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%