Designing a Framework to Determine Steel Price in Egypt

By

Moustafa Amin, Aiman A. Ragab, Mohamed A. Ragheb and Alaa A. El-Bary

Arab Academy for Science, Technology & Maritime Transport
P.O. Box 1029 Alexandria, Egypt.

Corresponding Author : Alaa A.El-Bary ***aaelbary@aast.edu***

Abstract

The current paper focuses on the areas of steel industry, exchange rates and interest rates in Egypt. It aims to develop a framework for the steel price in Egypt according to local changes in the exchange, inflation, and interest rates. The objectives of this study are to: investigate the factors affecting the steel market price in Egypt, identify the effect of competitive pressure from local and foreign steel players on steel market prices in Egypt, analyze the main elements that might affect the steel market price in Egypt, and develop a framework for the influencing factors to cope with the steel market price. Therefore, the problem the paper examines could be defined as the steel industry in Egypt should find a way to have its market share by competing with other participants in the global market. Thus, secondary data will be collected to describe the relationships assigned between the paper variables. The population is Egyptian steel companies while the sample used for this paper is Ezz steel company about each of the paper variables monthly from the year 2000 up to the year 2019. Such a study is important to develop a framework for the steel price in Egypt according to changes in the exchange rate, inflation rates, and interest rate in Egypt. The paper philosophy adopted in this paper is a Pragmatism Philosophy. The approach adopted in this paper includes the "Quantitative Approach" and the design adopted is the "Deduction Method". The findings from this research provides evidence that ore iron price and scrap price have a positive significant impact on steel market price. The finding of analysis shows that there is a positive correlation between the natural gas prices, electricity prices, and steel market price. On the one hand, it is noticed after examination that there is a positive significant relationship between both the inflation rate and exchange rates on the steel market price. On the other hand, there is a negative significant relationship between interest rate and steel market price. This paper recommends that there is a need to focus on the macroeconomic terms and elements that may affect the level of price in the steel market; namely inflation, interest, and exchange rates. It should also recognize the rule of the raw materials (iron ore price and scrap price) in the process of pricing system of steel in Egypt. Finally, the Egyptian government should facilitate the sources of energy for the process of production to reduce the cost of production.

Keywords: Exchange Rate, Inflation Rate (CPI), Interest Rate, Cost Position

1. Introduction

We have entered a new era of globalization with its advantages and disadvantages. The markets have been very competitive, not only domestically but also globally. Therefore, firms should be aware of this risky trend to survive; otherwise, it will threaten its existence. Firms with higher market share could influence the market and compete globally. For a closer look, this research examines the Egyptian market especially the steel industry. With globalization, the steel industry in Egypt is at a risk, and it should increase its market share to be able to survive and compete globally (Paul and Mukherjee, 2016).

On the other hand, according to financial theory; changes in exchange and interest rates affect the value of the firm. Hence, there has been much interest in evaluating the level of exchange or interest rates exposure a firm or industry faces. Exchange/Interest rates exposures refer to the extent to which the value of the firm is affected by their related changes. The issue of exposure to both the exchange and interest rate risk is of high importance to individual investors and firms (Bahmani-Oskooee et al., 2015).

For example, changes in exchange and interest rates can affect an investor holding a portfolio consisting of securities from different countries. Changes in exchange rates should naturally impact the cash flows of a multinational firm with operations in different foreign locations, importers, and exporters, and even solely domestic firms. Similarly, changes in interest rates will alter the firms' financing costs, affecting the amount of loan interest and principal payments and impacting cash flows of the firm. Therefore, this paper comes to explain the dimensions affecting the market pricing of steel industries in Egypt, as it is being exposed to globalization (Helmy et al., 2018).

The steel market in Egypt is considered a competitive market. With globalization happening worldwide nowadays, such a competitive market in the Egyptian steel industry is at a risk. Therefore, such an industry should find a way to have its market share by competing with other competitors in the global market. To gain a competitive advantage, the steel market price should follow a competing strategy by controlling elements that might affect the price (Kiron and Kannan, 2014).

The current research aims to develop a framework for the steel price in Egypt according to changes in the exchange, inflation, and interest rates in Egypt. Therefore, these research objectives could be stated as follows:

1. Investigate the factors affecting the steel market price in Egypt.
2. Identify the effect of competitive pressure from local and foreign steel players on steel market prices in Egypt.
3. Analyze the main elements that might affect the steel market price in Egypt.
4. Develop a framework for the influencing factors to cope with the steel market price.

2. Literature Review

Guerreiro and Amaral (2018) stated that the "cost plus margin" was the most frequently used in the cost-based price approach. The study was investigating the explanatory factors of price-setting practices, it concluded that price based on cost was the prevailing approach among the 270 industrial companies in the sample. In this study, the conclusion was that 56 percent of the respondent companies applied the cost-based price approach, while only 11 percent of the companies applied the value-based price approach. It was observed that the popularity of this method may be attributed to its simplicity also companies with more expertise to set prices devised a holistic approach in which they considered, in addition to costs, aspects related to the company and the market.

Ajaz et al. (2017) stated in their study of the relationship among stock prices, exchange rate, and interest rate. They suggested that tight money lowers stock prices. This could come about in at least two ways. First, tight money could increase the riskiness of stocks directly, for example, by raising the interest costs or weakening the balance sheets of the firms. Second, tight money could reduce the willingness of stock investors to bear the risk, for example by reducing expected levels of consumption. The results of the asymmetric reaction to exchange rate means that the depreciation of local currency raises the cost of imported inputs. This increases the production cost of importing firms. These higher costs may result in either, lower profits or expectation of lower profits and, hence, decreasing stock prices.

5.1 Pricing Strategy

Various aspects of company performance can be improved by adopting the practice of strategic pricing. Strategic pricing implementation involves finding a balance among customers, competitors, and costs information (Indounas, 2015). Looking deeper into the strategies of pricing, three major and critical pricing strategies are found namely: skimming pricing, penetrating pricing, and pricing similar to competitors. Based on financial needs and market requirements, it is necessary to understand better how pricing processes can be optimized (Neubert, 2017). Another research study has been adopted by Indounas (2018) on industrial service firms, and it was found that it supports the above conclusion. The findings suggest that to adopt an effective pricing strategy, managers need to pay attention to both the external and internal environment surrounding the firms which are market and company-related issues.

Many studies have addressed consumer reaction to price change. Price is likely to have a significant effect on consumer buying behavior. Consumers may be insensitive to small price changes or small differences in prices, and a change in price is likely to influence consumer choice only when the magnitude of the change is above a threshold. Price elasticity is a commonly used aggregate-level measure of price sensitivity. At the same time; consumers seem to shop in different places that offer them better value. There are two important aspects of price sensitivity: one related to the consumer's decision about which brand to buy (brand choice elasticity), and the other to the consumer's decision about how much to buy (primary demand elasticity). There is much evidence indicating that promotional price elasticity is driven much more by brand switching than by changes in the quantity purchased (Getoto, 2014).

Customers must have an appropriate level of price knowledge and price consciousness. As the common assumption about consumer purchasing behavior is that price plays a decisive role in the determination of the rate of purchases by customers. Price knowledge refers to consumers' familiarity with the prices of the goods which they buy. Permanent and accurate price knowledge may be expected to be present in the case of regularly recurrent purchases, especially food and other daily products. Consumers' price knowledge may be influenced by the degree of variation in prices (Sibomana, 2017).

In the event of exchange rate changes, destination-specific mark-ups are adjusted accordingly. In so doing, the new prices may reflect all or part of the changes in the exchange rate. Under these conditions, the purchasing power parity (PPP) theory inherent in the law of one price LOP does not hold; The producer currency pricing (PCP) explains the scenario where the exporting firm set import prices in the currency of the location where production takes place and the local currency pricing (LCP) pertains to a scenario where prices are set in the local currency of the destination market. In the case of PCP, Exchange Rate Pass-Through (ERPT) is the percentage change in local currency import prices resulting from a one percent change in the exchange rate between the exporting and importing countries. ERPT is likely to be more complete because the exporting firm's markup does not respond to the movements in the exchange rate. In the case of LCP, foreign firms may decide not to change the prices in the importing country currency but rather absorb the fluctuations within the markup. Pass-through to domestic prices will depend on the weight of imported goods in the total basket (Amoah and Aziakpono, 2017).

5.2 Exploring Steel Market Price

In the current research, the researcher investigates the pricing strategy in the steel sector taking Egypt as a case study. He investigates factors affecting the steel market price in Egypt, setting the steel market price as a dependent variable and examines the variables influencing it in Egypt. He identifies the role of raw materials pricing, utility prices as well as the macroeconomic factors impact on the steel prices of the industrial firms in Egypt. Studying the factors that influence the prices of the steel industry helps to analyze and forecast price changes in the market. Prior studies have been developed in that field, investigating these variables affecting the steel market price.

The steel industry in Egypt has been developing slowly, and the prices of this industry's products have recently fluctuated. To predict future price changes, factors that play leading roles in effecting prices of the steel market must be discovered. Previous research studies have shown that price fluctuations are often affected by more than one factor. Accordingly, the following subsections discuss some of the recent studies conducted for the effect of some criteria on the product pricing models.

The Effect of Raw Material Prices

Metals such as copper, gold, and iron are used as indicators in the financial markets. While iron is mainly the input for making steel, some prefer to take steel scrap as an indicator because of its exogeneity to business speculations and rapid adaptation to the macroeconomic

circumstances. Mining and transporting of raw materials can consume up to 8% of the total energy needed to produce steel. To understand the markets of raw materials steel making, the next subsections elaborate on the effect of iron ore and steel scrap and their significance.

Iron Ore Price

Hoang et al. (2018) has analyzed the effect of iron ore price shock on the macroeconomic variables and the performance of the economy in Australia. It was found that the effect of iron ore price shock depends on the source and direction of shock. This means if the price of iron ore increases by supply disruption this means supply shock, the output will increase. On the other hand, if the increase is from the demand side for example shift in market expectations, it would negatively affect economic activities. Therefore, it is important to identify the source of the iron ore price changes so that policymakers can develop suitable policies for the economy. It should be kept in mind that a particular commodity may have distinct effects on the economy. Also, Australia is an exporter of iron ore, therefore, the findings may differ if the country is an importer. Therefore, the current research studies the effect of iron ore prices on the steel market and the economy in Egypt.

Oil and iron mineral prices and costs have significant effects on the efficiency and the performance of emerging economies such as the MENA region or developed open economy such as Australia. A comparison of the correlation of the effects of oil and iron metal (ore) on key and main Australia macroeconomic measurements and indicators uncover and reveal significant implications and ramifications. Australia is a net oil importer nation however delivers, produces, and exports different forms and types of energy or vitality. On the other hand, the nation is the world's biggest exporter of iron metal (ore). Iron metal (ore) records for the biggest portion of Australia's exports in the international trade, near 20% of all out of the export value of the country international trade. Some researchers have compared the relative macroeconomic reflections of the whole world oil and iron ore (metal) pricing value shocks and fluctuations on the Australian economy (Hoang et al., 2018).

After using autoregression model some studies with sign restrictions, they concluded that the oil shock and volatility had a relatively bigger effect than the iron metal (ore) shock and volatility on output, inflation, and expansion, while the iron metal (ore) shocks and fluctuations were the predominant source and factor of interest and swapping scale of exchange rate movements. The impacts critically rely upon the fundamental resource of oil or iron ore value shifts. As Australia is considered as a small open economy, both of oil and iron mineral costs and price value ought to be treated as exogenous elements. Real GDP reacts contrarily to an ascent in oil costs driven by supply disturbances, however decidedly to a comparative stun on the iron metal market. Higher worldwide interest for these products positively affects the economy, yet the iron metal interest stun is about twice bigger. Be that as it may, a positive oil and iron mineral value stun was driven by explicit interest lead to a brief decrease in genuine GDP also, it could be considered that the iron ore price market may affect the steel price (Hoang et al., 2018).

Scrap Price

Recycling steel scrap is vital for steel production. Because steel is an essential metal in modern life, the price of steel scrap is considered an indicator of macroeconomic activity. Steel scrap is an important raw material in the steelmaking industry. Local supply and demand conditions in addition to externalities for example the financial market state often play an essential role in the market of steel scrap. However, there is no active exchange that trades steel scraps (Omura et al., 2016).

Gutierrez and Vianna (2018) have found in their results and outcomes propose that the steel commodity monetary and the product financial markets are likely in bigger weakness and larger disadvantage after the U.S. adoption and selection of higher import levies and tariffs, particularly because of those tariffs and quotes ought to curb exports and check trades by multinational corporations and worldwide organizations in iron ore mining (an iron mineral) and steel production and manufacture. There are additional evidence and proof that exceptionally diversified and expanded markets, for example, Germany and the United States are not influenced by these protectionist measures and standards for the short-term. Truth be told, higher import taxes, quotas, and tariffs on iron and steel imports may wind up positively affecting the U.S. market over the long run.

On the other hand, after the worldwide financial crisis and emergency broke out in 2008. This action animated and stimulated the rapid growth and the fast development of the steel industry and business and made China the world's driving nation in the assembling and manufacture of steel commodities and products, and China kept up this status for quite a while. Be that as it may, the worldwide economy was still in a period of moderate recuperation and slow recovery. With high levels of production, manufacture, and unsellable stocks compounded the overcapacity circumstance. In 2016, the development and the improvement of China's steel industry were never again stable or steady, with the introduction of such arrangements and policies as "going to limit". To forecast the development and gauge the advancement of the market, an expanding number of researchers have concentrated on the conjecture of value fluctuations and price changes in this industry. Numerous examinations in many studies have indicated that value changes and price fluctuations are frequently affected by more than one factor (Liu et al., 2019).

Liu et al. (2019) have discovered that some many components and factors are influencing the value changes and price fluctuations such as supply elasticity technique and demonstrated that Chinese steel production positively affects Australian iron metal (iron ore) demand.it has been demonstrated that market price mechanism which is the supply and demand is the most significant factor influencing China's iron metal (iron ore) import costs and prices. They utilized the empirical econometric regression technique to study and test the expansion in the cost and expense of raw materials and crude resources in China assumes a tremendous role in the South African economy.

From the above section, it has been recognized that there is a relation between the prices of crude materials and raw sources that used in the production process in the iron and steel industry and the steel market prices which lead to extract the following hypotheses:

H_1: There is a significant relationship between Raw Materials and Steel Market Price.

The Effect of Cost of Utilities

Farhani and Rejeb (2012) have deteriorated oil cost and price volatility and unpredictability as perpetual, permanent, transitory and brief parts or components and after that, they found that negative oil cost and prices shock and stun expanded the volatility and instability of oil cost significantly, while positive oil price value shock didn't have any critical or significant effect on oil value unpredictability and volatility. Anyway, they found that passing and transitory oil price value instability and volatility caused the large portion of the harms to the industrial production and output, while the perpetual part and permanent component of the oil cost value unpredictability had just temporary impact on industrial output (Ahmed et al., 2018).

Gas usage in the steel industry

Natural gas has been used widely in most of the industries as raw material and heating source as well. It is an essential element in production as it is much cheaper than other substitutes. All over the world economies, it is emphasized to shift industries if possible, from using oil to natural gas due to its various benefits ranging from environment friendly, efficiency, and cost-effectiveness. Whereas, the problem that could exist is that there may be a shortage of domestic natural gas in the country. This can significantly affect the price of natural gas, hence affect the production process. The effect of price change should be examined on the industrial production level to provide an understandable industry and proper forecasting for the economy (Ahmed et al., 2018).

It has been noted that the industrial production and manufacturing is one of the main and fundamental indicators of total national output (gross domestic product) which mirrors the general economic performance of a nation. As it was diminishing or increments in industrial production call attention to a contracting, extending, or expanding economy. Along these lines, changes and fluctuations in costs of oil and prices of natural flammable gas which are the critical inputs and the crucial factor of production to industrial production and manufacturing are additionally important and significant for the overall economy. many investigations inspect the impacts of changes and fluctuations in oil and natural gas costs and prices on the industrial sector in the whole world during many intervals of time by utilizing all types of data such as panel, cross-sectional, or time serious. It has been found and discovered that oil costs and natural gas prices harmed industrial production (Bayar and Kilic, 2014).

Electrical energy in the steel industry

At the beginning of this century, energy sparing and saving, cost reserve funds, and diminishing carbon dioxide outflows and emissions have turned into a significant worry and concern for the sustainability and manageability of steelworks. The accentuation is on doling out a committed workforce to decrease energy costs, discharges, and emissions on iron-and steel assembling and manufacturing plants and factories. Profitability and productivity in the steel business, both globally and locally (domestically), has radically decreased in the most recent

decade. Some studies in South Africa stated that the production of steel was somewhere near 4.5% year-on-year in 2015. This is because of both a struggling economy (financially) and a world and globe surplus in steel supply. The accentuation on cost decrease and reduction is hence considerably increasingly significant in South Africa to remain competitive in the worldwide steel market (Breytenbach, 2017).

Average energy cost decreases methodologies and reduction strategies center around huge capital expenditure ventures and projects. Steel plants and factories in South Africa have constrained capital expenditure to spend on electricity (energy) cost reduction. Electricity is a large energy source required in steel production. Steel manufacturing firms should be aware of the risks combined with high costs of electricity and how to reduce these risks and remain competitive in a complex and economically struggling industry. They should achieve electricity savings which could lead to quick benefits. Energy (electricity) management and power (electricity) cost decrease and reduction are significant in a steel plant and factories. It is the biggest energy consumer of all the modern industrial sectors and segments. For the steel business and industry to remain competitive, economically sustainable, and have minimal natural and insignificant environmental effect, energy protection, and conservation is critical and important. (Ludick, 2018)

It has appeared in many studies and researches that by applying the structure and the framework in the global steel plants, enormous electricity expenses, and power cost saving could be accomplished. It was evident that by utilizing the structure and using the framework, power cost and electricity expenses can be distinguished and the facilities organized and prioritised as needs be. By dependency, the Steel Market Price will be decreased. Therefore, one of the hypotheses of this research could be extracted as follows:

H_2: There is a significant relationship between Utilities Prices and Steel Market Price.

The Effect of Macroeconomic Factors

Seeing the importance of macroeconomic factors to the market price, researchers needed to analyze its impact as it was a core of study in many pieces of research. Macroeconomic variables include the exchange rate, interest rate, and inflation rate. The impacts of these dimensions on pricing have been discussed in prior studies as indicated in the following sub-sections:

Exchange Rate

The relationship between exchange rate movement and stock market returns is also explained within the context of importing and exporting firms. For a firm heavily involved in exports, depreciation in the exchange rate makes its products competitive, increasing both its performance and stock price. This may be useful in so far as the exporting firm’s products remain competitive on the international market. For heavily importing firms, exchange rate depreciation makes imports expensive, dampening firm performance and reducing their stock prices (Adjasi et al., 2011).

The impact of the exchange rate depreciation on a firm heavily involved in both exports and imports will however depend on the effect on each side of the traded item. This relationship is similar to the "import-export-dominant economies" explanation for the sign of the effect of exchange rate movements on stock return. Import dominant economy an appreciation of the exchange rate boosts stock market returns. Increase in the listing of export-based firms on African stock exchanges due to the exposure of these firms to hard currency exports. In their view, this will help African economies further to hedge significantly against exchange rate depreciation. Most African firms are also heavily dependent on imported machinery and in some cases, raw materials, thus rampant depreciation in the exchange rate would also affect production cost (Andrén and Oxelheim, 2011).

Inflation Rate

Taylor (2006) built up a hypothetical model to analyze the role of lower and more stable inflation in decreasing the degree to which firms “pass-through”, to their local costs, the impact of the exchange rate movements. As indicated by Taylor's model, the pass-through and persistence of price changes are directly related. At the point when firms choose the amount to alter their costs, they consider desires for future expenses and value developments. Taylor's investigation likewise exhibited econometric proof of a decrease in the ingenuity of total inflation as the inflation rate was diminished. Subsequently, lower inflation is associated with lower persistence of cost changes in the economy. Thus, Taylor's model showed that encountering a lower inflation condition may prompt a lower level of persistence of value shocks, subsequently diminishing the level of the exchange rate pass-through.

Various studies confirmed that inflation causes stock market development. The supporters of this hypothesis are Dritsaki (2005). On the other hand, other researchers recommend that causality keeps running rather from stock market development to inflation. Shahbaz et al. (2008). While other researchers supported the existence of feedback suggesting that stock market development and inflation can complement and reinforce each other, making inflation and stock market development mutually causal. Cakan (2013), Pradhan (2011).

Interest Rate

Many studies have dealt with the relationship between stock prices, exchange rate, and interest rate. Referring to the portfolio approach an increase in stock prices increases public wealth, which increases the demand for money and hence increases the interest rates. Increased interest rates attract foreign investment thus appreciating the domestic currency. On the other hand, depreciation of domestic currency can boost exports and, eventually, lead to the profiting of exporting firms. High profits once announced can cause share prices to rise. Furthermore, currency depreciation raises the cost of imported inputs, which in turn increases the production costs to the firms that are not export-oriented. When higher costs lead to lower profits or expectation of lower profits, share prices can be affected. For this reason, stock prices can move in both directions (Ajaz et al., 2017).

From the above section, it has been recognized that there is an association between Macroeconomic Factors (Inflation Rate, Interest Rate, and Exchange Rate) and the Steel Market Price. By definition, the researcher could conduct the hypothesis as follows:

H_3: There is a significant relationship between Macroeconomic Factors and Steel Market Price.

3. Research Framework

The research purpose is to examine factors that affect the steel market price in Egypt. Therefore, the current research framework could be expressed using Figure 1. The research variables are considered as the independent variable is considered as Raw Materials (Iron Ore Price, Scrap Price), Utility Prices (Natural Gas, Electricity), and Macroeconomic Factors (Inflation Rate, Interest Rate, Exchange Rate). The dependent variable is considered as the Steel Market Price.

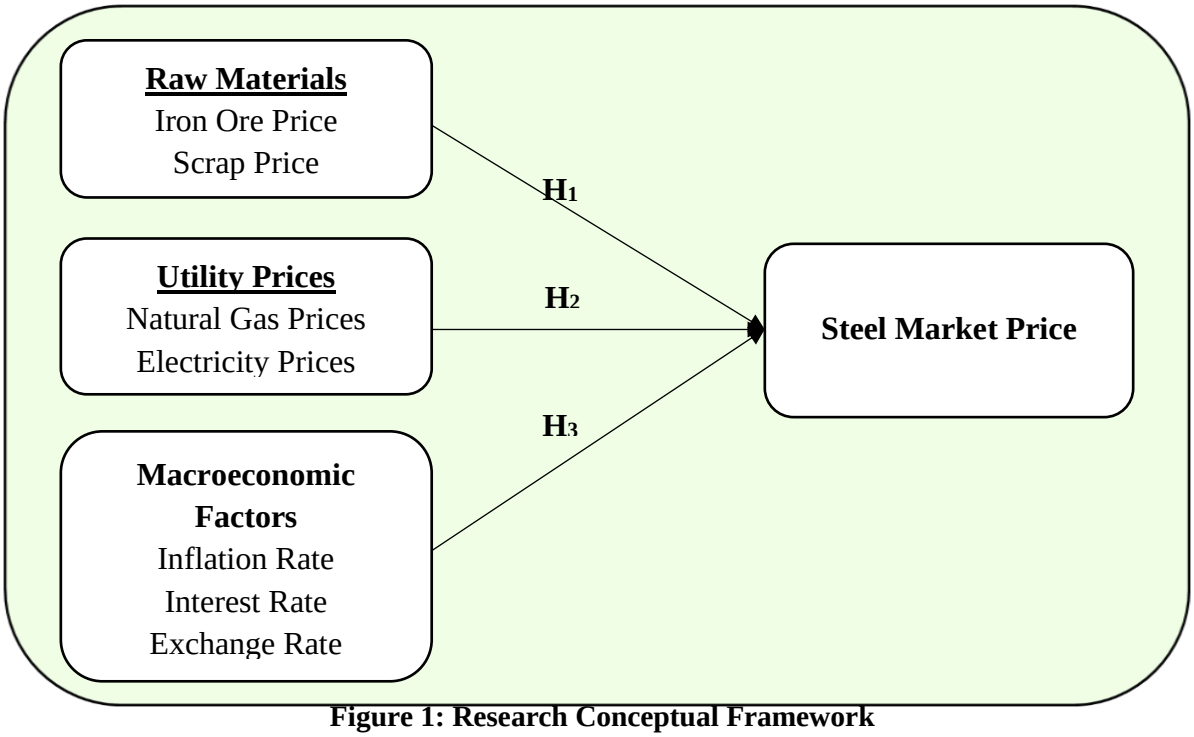

Figure 1: Research Conceptual Framework

4. Research Variable Measurement

In this section, the researcher illustrates and defines the variables adopted in the current research project. The dependent variable is Steel market price in Egypt while the independent variables are raw materials (iron ore price and scrap price), utility Prices (gas and electricity prices), and macroeconomics factors (inflation rate, interest rate, and exchange rate). Table 1 defines the inflation rate, interest rate, and exchange rate.

Table 1: Research Variable Measurement

Variable	Type	Definition
Exchange rate	Independent variable	It is the units of local currency that are paid for one unit of foreign currency (Ibarra, 2011).
Inflation rate	Independent variable	It is an average of the past rate and the rate of increase in tradable goods prices (Frenkel, 2008).
Interest rate	Independent variable	It is the reward for accumulating financial assets and foregoing current consumption. It is the opportunity cost of capital which influences the demand for loanable funds by different types of borrowers (Obansa et al., 2013).

5. Research Methodology

This section examines and clarifies the methodology used in conducting this research. It aims at testing the relationships and effects between the macroeconomic factors as inflation, interest, and exchange rates on the one hand, and the prices of raw materials used in the steel industry, prices of utilities and the steel market price on the other. In this research, the philosophy to be used is "positivism". The reason is that this research aims to test the relations between some economic elements and other aspects, which are related to the steel industry itself as the prices of raw materials and how these aspects affect the steel market price. Thus, the research examines the cause and effect relationship to get reliable results that can be generalized to the whole steel industry to operate within the light of these results by measuring these effects.

In this research, the approach will be "quantitative" as the variables are measured in numbers to be able to test the research hypotheses that depends on secondary data obtained from interviewing managers of Egyptian steel companies and from the official website of the central bank of Egypt about each of the research variables on a semiannual basis. Another reason to choose the quantitative approach is the chosen philosophy (positivism) as to conduct abstract laws as the main objective of positivists examinable results are needed to get shreds of evidence upon the founded relationships (Saunders et al., 2018). Deduction relies on the assumption of the "true" premise, accordingly, this makes it compatible with "positivism" which tends to test the cause and effect relationship and decide whether the statement describing the phenomenon is true or false by experiments, observations, and mathematical proof. This is the reason behind considering deduction as the appropriate method to use.

The research aims to develop a framework for the steel price in Egypt according to changes in the exchange rate, inflation rates, and interest rate which are in Egypt. Thus, the units of analysis considered for this research are the monthly data for the period from January 2000 to December 2019 for the steel industry in Egypt. According to this manner, the population is the steel industry for each of the research variables every month from January, the year 2000 up to December of the year 2019. Data is collected in the form of secondary data of the Egyptian steel industry about each of the research variables monthly. It is considered a secondary data type, which is used for several purposes and not for this research only. Data is collected in the form of time-series data from January 2000 up to December 2019.

6. Empirical Results and Findings

This chapter presents the descriptive statistics and the results and discussion. Also, the research hypotheses are tested using correlation analysis, simple regression analysis, and multiple regression analysis. Finally, a summary of the results and output of testing the research hypotheses is provided.

Descriptive Analysis

This section deals with the descriptive statistics for the data used in the analysis of this study. Some of the main features of the data will be described quantitatively (such as mean, max, min, standard deviation, Range, Variance). The whole table for the descriptive statistics of this study is presented in Table 2. Sometimes observations have missing value so; the number of observations differs from one variable to another. However, the estimated number of observations is supposed to be 240 observations It could be noted that the mean values of the research variables; Iron Ore Price, Scrap Price, Natural Gas Prices, Electricity Prices, Inflation Rate, Interest Rate, Exchange Rate, and Steel Market Price are: 691.48, 2456.11, 1.4368, 0.2805 0.1007, 0.0244, 7.5461, and 4401.08 respectively.

Table 2: Summary of Descriptive Statistics of Variables

	Range	Minimum	Maximum	Mean	Std. Deviation
Iron Ore Price	1822.23	165.75	1987.98	691.48	367.99
Scrap Price	5455.34	809.00	6264.34	2456.11	1483.86
Natural Gas Prices	4.61	.14	4.75	1.4368	1.50087
Electricity Prices	1.06	.07	1.13	.2805	.26004
Inflation Rate	.31	.02	.33	.1007	.06464
Interest Rate	.07	.01	.08	.0244	.01783
Exchange Rate	15.30	3.42	18.73	7.5461	4.24386
Steel Market Price	11136.38	1015.23	12151.61	4401.08	2808.97

Testing Research Hypotheses

According to this section, the research hypotheses are tested in the following sections. Each hypothesis is tested in one of the following subsections.

Cointegration using Johansen Model

Co-Integration is tested between the research variables; of electricity prices, exchange rate, inflation rate, interest rate, iron ore, natural gas, scrap price, and steel market price in Egypt on a monthly base from 2000 to 2019 using Johansen co-integration test. Johansen test is used rather than the Engle-Granger co-integration test because the Johansen test permits more than one Co-integration relationship than the Engle granger test. Table 3 shows the Johansen co-integration test for our research variables. The test shows that there is no co-integration as the p-value for all variables is less than 0.05. This means we can reject the null hypothesis that

variables are cointegrated. Therefore, there is no integration between variables, and the VAR model could be recommended for testing the relationships between the research variables.

Table 3: Co-Integration Test for the Research Variables

Sample (adjusted): 55 235				
Included observations: 181 after adjustments				
Trend assumption: Linear deterministic trend				
Series: STEEL EXCHANGE INFLATION INTEREST ELECTRICITY DGAS IRON SCRAP				
Lags interval (in first differences): 1 to 4				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.351812	330.5051	159.5297	0
At most 1 *	0.294624	252.0282	125.6154	0
At most 2 *	0.268793	188.8548	95.75366	0
At most 3 *	0.218298	132.1912	69.81889	0
At most 4 *	0.145917	87.61408	47.85613	0
At most 5 *	0.132232	59.0656	29.79707	0
At most 6 *	0.093987	33.39427	15.49471	0
At most 7 *	0.08222	15.52928	3.841466	0.0001
Max-eigenvalue test indicates 8 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

VAR and Lag Selection Test

Before performing the cointegration test and VEC modeling, we need to first determine the optimal number of lags to be used in the system equation. The following tables indicate the selection criteria for selecting the appropriate lag for each variable. We usually use the Akaike information criterion (AIC) in the process of selection. Table 11 tests the lag length for the first difference in the steel market price. It is noted that the first difference in the steel market price variable has 1 lag according to AIC.

Table 4: Lag Length Testing for Steel Market Price

VAR Lag Order Selection Criteria						
Endogenous variables: STEEL PRICE						
Exogenous variables: C						
Date: 10/10/19 Time: 15:26						
Sample: 1 240						
Included observations: 224						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	825.5516	NA	3.72E-05	-7.36207	-7.34684	-7.35592
1	851.8044	52.03681*	2.97e-05*	-7.587540*	-7.557078*	-7.575244*
2	852.275	0.928469	2.98E-05	-7.58281	-7.53712	-7.56437
3	852.3094	0.067692	3.01E-05	-7.57419	-7.51327	-7.5496
4	852.3723	0.122972	3.03E-05	-7.56582	-7.48967	-7.53509
5	853.1544	1.522225	3.04E-05	-7.56388	-7.4725	-7.52699

6	853.1657	0.022043	3.06E-05	-7.55505	-7.44844	-7.51202
7	853.4633	0.573754	3.08E-05	-7.54878	-7.42694	-7.4996
8	853.4704	0.01379	3.11E-05	-7.53992	-7.40284	-7.48458
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

After all the previous testing of the stationarity and co-integration and identifying the optimal lag for the research variables, the regression model is selected according to the results of previous conclusions. Now, the VAR model is used for the current regression model.

Table 5: Estimating the VAR Model

Vector Autoregression Estimates								
Sample (adjusted): 52 235								
Included observations: 184 after adjustments								
Standard errors in ( ) & t-statistics in [ ]								
	Steel market Price	Exchange rate	Inflation Rate	Interest Rate	Electricity Prices	Natural Gas Prices	Iron Ore Price	Scrap Price
Steel market Price (-1)	0.366	3.713	0.4932	0.135	-0.0737	1.649	0.4531	0.553
	-0.076	-1.90	-0.378	-0.09	-0.3774	-1.06	-0.330	-0.20
	[4.783]	[1.9]	[1.303]	[1.39]	[-0.195]	[1.54]	[1.37]	[2.73]
Steel market Price (-2)	-0.01	-0.533	0.6965	-0.134	0.032	-0.065	0.3049	-0.456
	-0.07	-1.758	-0.348	-0.089	-0.348	-0.984	-0.304	-0.186
	[-0.169]	[-0.30]	[1.996]	[-1.50]	[0.094]	[-0.06]	[1.00]	[-2.4]
Exchange rate (-1)	-0.005	-0.020	0.0497	0.001	0.003	0.059	0.0209	-0.012
	-0.006	-0.158	-0.031	-0.00	-0.031	-0.08	-0.027	-0.016
	[-0.827]	[-0.13]	[1.581]	[0.1]	[0.1230]	[0.67]	[0.76]	[-0.7]
Exchange rate (-2)	0.008	0.173	0.0569	-0.013	-0.0053	0.114	0.0076	0.044
	-0.006	-0.15	-0.031	-0.008	-0.0313	-0.08	-0.027	-0.01
	[1.260]	[1.094]	[1.810]	[-1.66]	[-0.170]	[1.28]	[0.27]	[2.64]
Inflation Rate (-1)	0.022	-0.287	0.2081	-0.024	0.0885	-0.122	0.0271	0.042
	-0.016	-0.402	-0.079	-0.020	-0.079	-0.225	-0.069	-0.04
	[1.362]	[-0.71]	[2.606]	[-1.21]	[1.111]	[-0.54]	[0.38]	[0.99]
Inflation Rate (-2)	0.003	-0.457	-0.008	0.033	0.0106	-0.061	-0.093	-0.032
	-0.016	-0.415	-0.082	-0.02	-0.082	-0.232	-0.072	-0.04
	[0.239]	[-1.10]	[-0.09]	[1.58]	[0.129]	[-0.26]	[-1.29]	[-0.7]
Interest Rate (-1)	0.003	-0.583	-0.095	0.137	0.2097	-0.139	-0.280	-0.167
	-0.057	-1.438	-0.285	-0.07	-0.284	-0.805	-0.249	-0.152
	[0.06]	[-0.40]	[-0.33]	[1.8]	[0.736]	[-0.17]	[-1.12]	[-1.1]
Interest Rate (-2)	-0.01	-0.208	-0.654	0.281	0.0225	0.086	-0.179	-0.178
	-0.057	-1.435	-0.284	-0.07	-0.284	-0.80	-0.248	-0.152

	[-0.177]	[-0.14]	[-2.29]	[3.87]	[0.079]	[0.11]	[-0.72]	[-1.2]
Electricity Price (-1)	0.001	0.173	0.1172	-0.002	-0.01358	0.0159	0.0937	0.025
	-0.01	-0.455	-0.09	-0.023	-0.09058	-0.256	-0.079	-0.04
	[0.09]	[0.37]	[1.28]	[-0.096]	[-0.14997]	[0.06]	[1.18]	[0.53]
Electricity Price (-2)	0.005	0.160	0.029	0.023	-0.06236	0.0240	-0.029	-0.01
	-0.01	-0.450	-0.08	-0.022	-0.08926	-0.252	-0.078	-0.04
	[0.2]	[0.357]	[0.33]	[1.011]	[-0.69861]	[0.09]	[-0.37]	[-0.3]
Gas Price (-1)	0.012	-0.099	-0.023	-0.009	-0.02111	-0.071	-0.044	-0.021
	-0.01	-0.278	-0.055	-0.014	-0.05524	-0.156	-0.048	-0.029
	[1.09]	[-0.35]	[-0.41]	[-0.683]	[-0.38213]	[-0.45]	[-0.91]	[-0.7]
Gas Price (-2)	-0.02	-0.241	-0.079	0.0155	0.004656	-0.154	-0.027	-0.054
	-0.011	-0.276	-0.054	-0.0139	-0.05468	-0.154	-0.047	-0.029
	[-2.14]	[-0.87]	[-1.44]	[1.109]	[0.08515]	[-1.00]	[-0.56]	[-1.8]
Iron Ore Price (-1)	0.046	0.475	-0.134	0.0046	-0.08788	0.087	-0.026	0.133
	-0.02	-0.501	-0.099	-0.0254	-0.09935	-0.28	-0.087	-0.05
	[2.28]	[0.947]	[-1.348]	[0.183]	[-0.884]	[0.31]	[-0.31]	[2.5]
Iron Ore Price (-2)	0.025	-0.321	-0.0592	-0.0103	-0.002	-0.431	-0.104	-0.004
	-0.02	-0.518	-0.1029	-0.0262	-0.102	-0.290	-0.089	-0.055
	[1.21]	[-0.61]	[-0.575]	[-0.392]	[-0.02]	[-1.48]	[-1.15]	[-0.1]
Scrap Price (-1)	0.130	-0.758	-0.1649	0.1256	0.003	-0.207	-0.158	0.133
	-0.032	-0.751	-0.1491	-0.038	-0.14	-0.420	-0.130	-0.07
	[4.33]	[-1.009]	[-1.105]	[3.299]	[0.02]	[-0.49]	[-1.21]	[1.66]
Scrap Price (-2)	0.117	0.1801	0.1279	0.1467	-0.045	0.004	0.1594	-0.184
	-0.032	-0.804	-0.159	-0.040	-0.15	-0.45	-0.139	-0.085
	[3.634]	[0.223]	[0.801]	[3.601]	[-0.28]	[0.01]	[1.14]	[-2.1]
C	0.0001	0.0072	-0.001	-0.000	0.004	0.008	0.0013	0.001
	-0.000	-0.008	-0.001	-0.000	-0.001	-0.004	-0.001	-0.00
	[0.349]	[0.896]	[-0.80]	[-0.525]	[3.126]	[1.96]	[0.96]	[1.33]
R-squared	0.5212	0.0523	0.225	0.3134	0.0208	0.0424	0.081	0.188
Adj. R-squared	0.4753	-0.038	0.151	0.2476	-0.072	-0.049	-0.008	0.110
Sum sq. resids	0.0027	1.7139	0.067	0.0043	0.0672	0.537	0.051	0.019
S.E. equation	0.0040	0.1013	0.020	0.0051	0.0200	0.056	0.0175	0.010
F-statistic	11.362	0.5770	3.036	4.7650	0.2219	0.462	0.9275	2.421
Log-likelihood	760.47	169.11	466.6	717.92	467.09	275.8	491.52	581.8
Akaike AIC	-8.081	-1.653	-4.88	-7.618	-4.892	-2.81	-5.15	-6.13
Schwarz SC	-7.784	-1.356	-4.590	-7.321	-4.595	-2.51	-4.86	-5.84
Mean dependent	0.0006	0.0085	-0.000	0.0001	0.0043	0.009	0.001	0.000
S.D. dependent	0.0056	0.0994	0.0218	0.0059	0.0193	0.055	0.017	0.011
Determinant resid covariance (dof adj.)		1.09E-29						
Determinant resid covariance		5.02E-30						
Log-likelihood		4117.9						
Akaike information criterion		-43.28						

Schwarz criterion	-40.9056						
Number of coefficients	136						

After determining the suitable regression model, the last step is to test the causality, which means what vare causes the other variable to happen. Granger Causality test is used, with a lag length of 5 lags according to the lag test results. Table 6 shows the Granger Causality test for the research variables, it suggests that:

1. Exchange Rate does not Granger Cause Steel Market Price
2. Gas Price does not Granger Cause Steel Market Price
3. Iron Ore Price does not Granger Cause Steel Market Price
4. Scrap Price does not Granger Cause Steel Market Price

Table 6: Granger Causality Test for the Research Variables

Pairwise Granger Causality Tests			
Sample: 1 240			
Lags: 5			
Null Hypothesis:	Obs	F-Statistic	Prob.
Exchange Rate does not Granger Cause Steel Market Price	227	2.2771	0.0481
Steel Market Price does not Granger Cause Exchange Rate		0.81663	0.539
Inflation Rate does not Granger Cause Steel Market Price	227	1.84779	0.1048
Steel Market Price does not Granger Cause Inflation Rate		2.14305	0.0615
Interest Rate does not Granger Cause Steel Market Price	227	0.2594	0.9347
Steel Market Price does not Granger Cause Interest Rate		3.30305	0.0068
Electricity Price does not Granger Cause Steel Market Price	227	0.75405	0.5839
Steel Market Price does not Granger Cause Electricity Prices		0.3046	0.9098
Gas Price does not Granger Cause Steel Market Price	181	2.63427	0.0254
Steel Market Price does not Granger Cause Gas Price		1.16971	0.3261
Iron Ore Price does not Granger Cause Steel Market Price	193	3.21215	0.0084
Steel Market Price does not Granger Cause Iron Ore Price		2.52214	0.031
Scrap Price does not Granger Cause Steel Market Price	181	11.0879	3.00E-09
Steel Market Price does not Granger Cause Scrap Price		2.01549	0.0788

7. Conclusion

This study focuses on three main objectives. The first objective is measuring the impact of prices of raw materials on the steel market price in Egypt. It is attained by formulating the first hypothesis and two sub hypotheses. The results showed that iron ore price and scrap price have a positive significant impact on steel market price. The second objective is measuring the impact of utility prices on the steel market price in Egypt. It is accomplished by defining and formulating the second hypothesis and two sub hypotheses. The finding of analysis discovered that there is a positive correlation between the natural gas prices, electricity prices, and steel market price. Finally, the third objective is measuring the impact of macroeconomic factors on the steel market Price in Egypt. It is accomplished by defining and formulating the third hypothesis and three sub hypotheses. It has been noticed after examination that there is a

positive significant relationship between both the inflation and exchange rates on the steel Market Price. On the other hand, there is a negative significant relationship between Interest Rate and Steel Market Price.

This research is considered useful for producers of steel and decision-makers in the steel market and industry in Egypt. Also, the results of this study may be useful for the Egyptian government to encourage and implement policies to develop and enhance the industrial steel in Egypt to cope with the steel competitive market around the globe. It helps to understand the relationship between the Raw Materials, Utilities Prices, and Macroeconomic Factors, which are affecting the Steel Market Price in Egypt. Regarding the recommendations for the current research and to improve and develop the price mechanisms of the steel industry, there is a need to focus on the Macroeconomic Factors affecting the level of prices in the steel market, such as Inflation Rate, Interest Rate, and Exchange Rate. It should also recognize the rule of the Raw Materials (Iron Ore Price and Scrap Price) in the process of pricing system of steel in Egypt. Finally, the Egyptian government should facilitate the sources of energy for the process of production to reduce the cost of production.

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