



## Investigating the Effects of Regulation of Iran Mercantile Exchange on Goods Price Growth

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### Abstract

One of the important socioeconomic tasks of governments is regulation. Regulation literature focuses on government intervention in the market for regulating the amount of production and distribution of a commodity, which can lead to the determination of the structure and rules governing the market. A commodities exchange is one of the most important regulatory agencies, which, by providing a convenient, transparent and observable trading system, is customary for the flow of government-specific regulations on commodities. The aim of the present study is to test the regulatory results of supply of products in the commodities exchange. To this end, the percentage increase in the price of 12 commodities traded on the commodities exchange was compared with 21 off-exchange trades using the Propensity Score Matching technique, Caliper and Radius Matching technique, and Bootstrap Standard Deviation. According to the obtained results, the supply of commodities on the Iran mercantile exchange has led to a decrease in their price growth compared to similar commodities outside the Iran mercantile exchange. As a result, using regulatory agencies such as the commodities exchange will increase production and welfare of the society.

## 1. Introduction

Regulation is a trans disciplinary concept and experts in various fields such as economics, law, political science, management, public policy, and even psychology have done many studies to examine its various dimensions. It is now mentioned as one of the basic socioeconomic tasks of any government. That is, the government can determine the structure and rules governing the market to regulate the production and distribution of a commodity (Grand, 1991). Around the economics literature, market failures are taken as the most fundamental economic reason for justifying government intervention. In other words, whenever the market is unable in production and optimal allocation, the government (which has so far only been tasked with policymaking) confronts

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with the market failure. Government intervention can be either direct production of commodities (such as power generation) or regulation.

A commodities exchange is a coherent and mature market where a large number of suppliers offer their merchandise under the supervision of the experts of this institution. The advantage of a commodities exchange is the presence of supervision and regulation bodies in which all producers, consumers and traders enjoy the benefits of commodities exchange regulations. The deficiencies of traditional markets in the form of lack of transparency in price discovery and the existence of excessive intermediaries as well as the lack of necessary guarantees for traders are among the most important reasons for launching commodities exchange in the world. The mentioned issues may initiate problems such as: the spurious fluctuations of the price of products caused by the unclear and inappropriate connection between supply and demand; the impossibility of risk management and the protection of future fluctuations in prices; the absence of a transparent pricing system based on the supply-demand equilibrium and market demand; the absence of an executive system supervising the fulfillment of the obligations of the parties to the transaction; the lack of a gathering system, processing and analysis of information and statistics on production; imports, exports, and consumption in order to inform the market and desirable decision, the lack of coordination between production and commercial sectors regarding import, export and consumer market. To this end, there is a need to create a structured and organized market for the free confrontation of supply and demand, as well as providing the facilities necessary for the distribution and dissemination of business information as well as other information necessary to make a decision on the transaction. The present study seeks to answer this question: is the commodities exchange regulation effective on the price discovery process? Accordingly, in order to show the quantitative effects of commodities exchange regulation on the price of goods in Iran, 12 companies that have listed their goods in Iran Mercantile Exchange and 21 companies that did not so (based on the complete information needed to estimate the model), were selected. Then using the Matching model, this issue was examined whether listing a commodities exchange has a significant effect on the growth of prices.

In the next section of the study, theoretical and empirical foundations on the subject of the study are described. The third section is devoted to a review of previous studies. In the fourth section, the research methodology and statistical bases are explained. In the fifth section, the effect of regulation of the commodities exchange on the price of commodities listed in Iran Mercantile Exchange is analyzed, and the results are presented. Finally, the study summarizes the most important research findings and the proposed policies.

## **2. Theoretical Framework**

Regulatory controls and orders are considered the first official approach of most governments to deal with inefficiencies in the administration of public resources. If this regulation fails to resolve the problem, then it results in direct

government interventions and sometimes, government ownership (Khandouzi, 2010). If this government regulation reveals its inefficiencies after some time, the turning point for market-oriented alternatives or deregulation will arise. Moreover, if this government tact and the inerrancy of private relations lead to a crisis, the time for re-regulation will come to pass (Libecap, 2009).

In the economic literature, two theories have been used to explain regulation; the first theory is well known for the "aid hand" theory, which explains regulation to prevent market failure. The aim of the second theory that is well-known for the "public interest" is to regulate the achievement of "public interest" (Schleifer, 2005). Hetrog (1999) argues that in theories of economic regulation, one has to separate the positivistic and normative theories. In positive theories, the economic explanation of regulation is discussed and its consequences are expressed regarding two categories of public or private interests, while in normative theories, the goal is to find the most efficient type of regulation. In normative theories, a cost-benefit analysis is presented among different regulation instruments.

If the two main assumptions about welfare economics of Kenneth Arrow's followers, i.e., the optimal allocation of resources by the market mechanism, and the lack of many of the conditions for the competitive market performance in the outside world, are accepted, the market performance is inevitably linked to market failure with inequity, which the government regulation is considered one of the solutions for increasing the optimality of mechanism results (Khandouzi, 2010).

The most important market self-regulation problems requiring the presence of external regulation are incomplete competition and natural monopolies, imbalances, information dilemmas, external implications, public commodities or moral hazard, and social justice requirements.

From the perspective of public interest theory, there are two main reasons for the deregulation process: first, some examples of market failures were out of the failure category, i.e., technological factors or demand side caused examples such as less natural monopoly suffer from market failures; second, there were more effective options than regulation for solving the problem of market failures, in particular, regulations performed by civil or public entities. Ronald Coase (1988) defines the market as institutions that have been created to facilitate exchanges and reduce transaction costs. Yarrow (2015) uses this definition and claims that testing this essential task of the labor market is very difficult or impossible, since in most models, for mathematical simplicity, transaction costs are assumed zero, the market plays a spirit-like role, and many of its failure conditions are not considered.

However, the government intervention to counter market failures has not always been successful. Here, along with the literature of the market failure in the economy, the literature of government failure is also formed. Of course, government failure is limited to regulation, but may also be the basis for

government failure in the commission or presentation of a tax plan (Grand, 1991).

The view of Alvin Ross (2015, Nobel prizewinner for economics) towards free markets and regulations is also interesting. He likens the market to a wheel that needs to be freely rotated, while the wheel can move to any side that make its rotation difficult. However, if this wheel is fastened by an axis, it can spin well and freely around that axis. The market also needs to be central rule for appropriate performance, so that it can move freely.

Yavari (2014), viewed regulation and introduced the regulating institutions as “special public and independent government entities” based on market analysis (with a liberal approach) and in the case of inefficiency and inadequacy, self-regulation comes to pass. This view generates two differences in the way the government views: first, the government is not “the active agent of monopoly” in the administration of public affairs, and secondly, “the classical and hard social institutions” are not the only organizational framework and method in regulation and organization of relations in collective life.

The most important feature of regulating institutions is the possibility of separating certain regulatory and supervisory tasks from a government supervisory authority and delegating it to other private entities active in the securities market or even investors because of the flexibility and enjoyment of those institutions from professional and ethical standards beyond the government rules and institutions. A supervisor’s supervision continues to monitor the current performance of regulation. Among the most important of these institutions or regulators, the securities and exchange organization can be mentioned as an active one in this field. The securities, exchange organization, and its subsidiaries lead the regulatory and supervisory objectives of the securities market. In recent years, technological advances and their impacts on the structure and activity of the stock market have transformed the shape and structure of the regulatory and supervisory framework governing the activities of stock exchanges. Typically, the stock market includes regulators including the stock exchanges, commodities exchanges, securities depositories and securities brokers, and brokers' associations and securities traders. However, the stock exchange normally does its regulatory tasks by providing an efficient and appropriate trading system for settlements; monitoring trading flows, market operations and member activities, providing facilities for distribution and dissemination of trading information and other information necessary for making decisions on the trading of securities.

The legitimate system of supply and demand minimizes market fluctuations by defining and creating good conditions for the relationship between the seller as the supplier and the buyer as a demand factor and direct monitoring of it, through appropriate legal and executive mechanisms, and by creating a system for information, processing and analyzing market information in order to inform the seller and buyer of the background and future of different trades. The establishment and formation of commodities exchanges have numerous benefits

and advantages, one of the most important of which is to reduce the price fluctuations. Over the past few decades, various commodities exchanges have been established in the world with a view to achieve a legitimate system. Price fluctuations in the stock is a function of supply and demand, and therefore, prices increase or decrease based on market conditions. These fluctuations have their economic reasons. Commodities exchanges can alert economic events and events even before happening, and this compensates for the weakness of governments. Thus, since many companies have offered their products on the stock market, the purpose of the study is to examine the effect of regulation of this market on the price of commodities listed on Iran Mercantile Exchange.

### 3. Literature Review

Referring to changing Iran's attitude toward government-market orientation towards market orientation, [Khandouzi \(2010\)](#) promised the birth of a new issue called regulation in Iran by which the methods and means of government intervention in the economy are different from traditional methods (such as direct management or monetary-financial policies – commercial methods).

[Klapper and Love \(2004\)](#) claimed that the shareholders of poorly managed firms are heavily reliant on the legal support of regulating their large shareholders. [Berkman et al. \(2011\)](#) studied the effects of regulation on the Chinese stock market, suggesting that poorly managed firms gain more abnormal gains than strong-management firms do at the time of the introduction of new rules to their shareholders.

[Del Brio et al. \(2010\)](#) looked at the differences of regulation in the British and Spanish stock markets and their effects on market efficiency and indicated that despite a tighter regulation in the UK, people who use certain information have been able to generate more unusual profits (than the Spanish people). This has led to a decrease in the efficiency of the markets in both countries. Of course, according to this study, regulation in these countries have been able to improve efficiency through increased transparency and quick correction of prices.

[Cumming et al. \(2011\)](#) also examined the fluctuations and liquidity of 42 stocks in the world, recognizing that the behavior of financial markets depends on the specific rules of the market rather than manipulating the market or using latent information. The main conclusion of the study is that the reason for the differences in the features of different markets is the difference in their regulations. For example, a survey done on the Chinese stock market shows that the fluctuations of this market has varied over time, but one factor that has significantly affected those fluctuations is government regulation and interventions in the market.

One of the rules imposed both in Iran financial markets is the scope of the fluctuation. Investigating the effects of curbing price fluctuations in the stock market in Athens has been studied by [Phylaktis et al. \(1999\)](#), who concluded that regulation method was unable to curb price fluctuations. Of course, in the

Tehran Stock Exchange, curbing on price fluctuations can lead to a positive autocorrelation with daily returns of shares, because it slows down the trend of news coverage on stock prices (Jalali Naeini et al., 2011).

La Porta et al. (2000) indicated that the value of firms in countries that have better rules for protecting investors is higher than that of those, which suffer from the weakness of regulating financial markets. They have suggested that the rules and procedures for converting to some successful standards converge.

In the context of a theoretical model, Glaeser et al. (2001) claimed that regulation could be a substitute for the weakness of the judiciary in the markets of countries with legal weaknesses. By contrast, if the assumption that regulators also decide based on personal interests is considered, the debate about the conquering of regulatory is captured by the government or the private sector.

Investigating the regulatory capture of financial markets by the government, Berkman et al. (2011) in a study conducted on the Chinese market context showed that firms that have many connections with the government are less likely to be affected by new rules. This suggests that most stock market stockholders in China expect regulators to tighten controls on government-owned shares or, in practice, to regulate the interests of those firms.

Dunkley et al. (2014) examined the formation of the stock market in Vietnam and assessed the role of regulation with regard to the specific characteristics of Vietnamese firms. One of the characteristics of Vietnamese enterprises is that after the privatization of government dominance remains in many cases. One of most important results obtained from their study is that copying the rules governing the financial markets of developed countries is not necessarily an appropriate way to regulate the rules of financial markets in developing countries.

Regarding the fundamental principles and global standards of desirable regulation, Jahanbin and Zarei (2014) considered the necessity of distinguishing the position of the government and regulatory bodies in the insurance industry, as a pillar of the financial markets. They also claimed to provide its efficiency and sustainability through the transition from the macroeconomic approach of governments from the traditional form of control-command system to the internalizing regulations system, which is shaped by the employer-worker theory.

Different studies show that, firstly, their focus is on the explanation of various types of regulation in various fields, including economic and legal ones, and, secondly, most of them have descriptive analysis and covered the theoretical aspect of the discussion by neglecting empirical argument. As a result, it seems that a quantitative study on the effect of regulation on the economic sectors can cover the vacuum. Therefore, considering the significance of the issue, in this study, due to the lack of an empirical quantitative study on regulator debate in Iran, using the data of companies that have offered their products on the commodities exchange and the other companies that did not have this approach, the effect of commodity regulation on commodity prices

was examined. To this end, the non-parametric matching model was employed. The nonparametric approach, contrary to the parametric approach, assumes the linearity of regression analysis and gives more flexibility to the model (Fattahi, 2011). Then, the model is presented and its results are discussed. An implicit assumption of a parametric approach is that the regression curve can be expressed in terms of a parametric model, or at least it is thought that the bias approximation is small and negligible, in comparison with the best predictive parameter. A predetermined parametric model may be very limiting and small-scale for estimating the unexpected characteristics of the model, while the nonparametric uniformity approach offers a flexible tool for analyzing unknown regression models. Therefore, the nonparametric description refers to methods without regard to distribution. In this sense, neither the distribution of errors nor the form of the function of the mean of the function is predetermined and identified (Hardle, 1994).

#### 4. Methodology

According to Zhao (2004), matching and treatment evaluation is a method via which the effects of the implementation of programs and policies on economic indicators are examined by dividing units (for example, countries, firms, and households) into a treatment group (which participates in a program) and the control group (not participates in a program). In addition, when a researcher faces only empirical observations (Keshavarz, 2016), he can measure the effect of an economic intervention or an implemented policy, or test the effect of the hypothesis test by matching observations without the desired functional form of the variable. The regulation effects can also be achieved by considering the two treatment and control groups (i.e., those who have listed their goods and those that have not done so) as a program in this model and examine its effects on price growth. Therefore, in the theoretical framework, the effects of participation in a program such as being listed in the commodities exchange is examined in the process of examining an economic transformation, such as the formation of a commodities exchange. One of the methods for analyzing the effects of policies and socioeconomic interventions on the behavior of economic variables is the Treatment Evaluation method. When a researcher faces only empirical observations (Ibid), he/she can measure the effect of economic interventions or made policies and test the hypothesis by examining the hypothesis without specifying the functional form of the considered variable. Hence, the matching method is considered as a nonparametric approach in econometrics. Indeed, contributing to a program creates the effect caused by participants' responses to its implementation. The created effect is the result of the desired program execution.

The aim of this method is to obtain the average effect of a binary treatment variable on a response variable. For each unit  $i$ , where  $i = 1, \dots, N$ , there are two values of  $Y_i(0)$ , which represents the value when participating in the program

and  $Y_i(1)$ , otherwise. The variable  $W_i \in \{0,1\}$  is defined as the participation in the program as follows:

$$Y_i = \begin{cases} Y_i(0) & \text{if } W_i = 0 \\ Y_i(1) & \text{if } W_i = 1 \end{cases} \quad (1)$$

where, if  $Y_i(1) - Y_i(0) > 0$  indicates that the executed program is effective on the  $i^{\text{th}}$  unit. The following equation can be used for the treatment effect in the population:

$$E(Y_1 - Y_0) = E(Y_1) - E(Y_0) \quad (2)$$

If participants are randomly divided into either treatment or control groups, this can be described as follows:

$$\begin{aligned} \tau &= E(Y|W = 1) - E(Y|W = 0) = E(Y_1|W = 0) - E(Y_0|W = 0) \\ &= E(Y_1) - E(Y_0) \end{aligned} \quad (3)$$

If participants are not randomly divided, other variables, affecting Y that are observable should be identified and their effects should be removed; so that groups whose values are equal or similar in these variables (which are described by the X explanatory variables and have the dimension k) are compared with each other:

$$\begin{aligned} E(Y|X = x, W = 1) - E(Y|X = x, W = 0) &= E(Y_1|X = x, W = 0) - E(Y_0|X = x, W = 0) \\ &= E(Y_1|X = x) - E(Y_0|X = x) = E(Y_1 - Y_0|X = x) \end{aligned} \quad (4)$$

where random division is done under the given x, which is called *the selection on observation* (Lee, 2005). Assuming participation in a program is independent of the response variable (Rosenbaum & Rubin, 1983), as well as the probability of participating in the program in each x given in intervals 0 and 1 (Heckman et al., 1998), the treatment effect is obtained as follows:

$$\begin{aligned} \square(x) &= E[Y(1) - Y(0)|X = x] \\ &= E[Y|W = 1 \cdot X = x] - E[Y|W = 0 \cdot X = x] \end{aligned} \quad (5)$$

Under these conditions, the difference between the variables on the right-hand of the equation can be identified for each x. As a result, the mean *treatment effect* is obtained by the computation of  $E[Y|W = 1 \cdot X = x] - E[Y|W = 0 \cdot X = x]$  in all x distributions (Abadie and Imbens, 2010). The mean treatment effect for the treated group is as follows:

$$E[\tau(X)] = E[E[Y|W = 1 \cdot X = x] - E[Y|W = 0 \cdot X = x]] \quad (6)$$

One of the most important challenges in treatment evaluation program is to answer this question: if the program was not implemented, to which level would the study variables reach for individuals exposed to the program? In other words, in each of the groups, only one of the two variables  $Y_i(1)$  and  $Y_i(0)$  is visible in the treatment group  $Y_i(1)$  and in the control group  $Y_i(0)$ . Finding the answer to the above question requires an abstract concept that is counterfactual (Imbens and Wooldridge, 2008). To this end, first the potentially *invisible reaction* variable in each sample should be estimated (Start, 2010) so that the *response variable* outside the program) is considered the equality of the explanatory variable X as an estimate for a variable exposed to treatment. If participation in treatment for units with the same explanatory variables is completely random, the control group's response variable can be used to

estimate the lack of participation in the treatment program, provided that the explanatory variables are same. This is the basic idea of the matching method (Keshavarz, 2016). For each unit, the matching estimator equals the value of non-program variables as inaccessible values for explanatory variables.

The matching method, as can be done on observable data, can also be done on the *propensity score* obtained from the variables (Frlich, 2007). In matching method conducted on the propensity score, when the dimensions of the vector of control variables are large enough for assuming the overlapping of data is difficult (Cameron and Trioy, 2005), a logit or probit estimate is firstly fitted on the vector of control variables, and then the probability of participation in the program is obtained for each unit and the data matching is done via the same propensity score. In matching method, using the propensity score, matching operations can be performed via the four nearest neighbor methods (Becker and Aichino, 2002), *Caliper and Radius, Stratification and Interval, and Kernel Matching* (Frolich, 2004 and Todd, 2006).

An estimation of the effect of a program based on the propensity score is performed in several steps; first, a probability value for each unit is estimated by logit regression or probit, in which the variables are entered as explanatory variables in the model. In the Caliper and Radius Matching method, by imposing a tolerance on the maximum distance of the propensity score, pairing the observation of elements with high distances are prevented. Technically, this type of matching means comparing a number of control group individuals with an individual from the treatment group, so that the propensity score of the control group be in  $r$ -neighborhood of the elements in the treatment group. It is clear that the number of the matched individuals may be more than one. This kind of matching can be symbolically represented as follows:

$$C(i) = \{P_j \mid |P_i - P_j| < r\} \quad (7)$$

This is to say that all elements of the control group that have the  $P_j$  participation probability, and this probability value in  $r$ -neighborhood  $P_i$ , is a suitable pair for the tested individual. If the number of paired individuals in the control group is defined with the  $i^{\text{th}}$  individual from the treatment group represented as  $N_i^C$  and weigh  $\omega_{ij} = \frac{1}{N_i^C}$  is defined with the condition  $j \in C(i)$  and otherwise with  $\omega_{ij} = 0$ , then the treatment effect is expressed as<sup>1,2</sup>:

$$\begin{aligned} \hat{\tau}_{ATT}^{PSM} &= \frac{1}{N^T} \sum_{i \in T} Y_i^T - \sum_{j \in C(i)} \omega_{ij} Y_j^C = \frac{1}{N^T} \left( \sum_{i \in T} Y_i^T - \sum_{j \in T} \sum_{j \in C(i)} \omega_{ij} Y_j^C \right) \\ &= \frac{1}{N^T} \sum_{i \in T} Y_i^T - \frac{1}{N^T} \sum \omega_j Y_j^C \end{aligned} \quad (8)$$

where  $\omega_j = \sum_{j \in T} \omega_{ij}$  and  $N^T$  are the number of elements of the subsample of the experiment (Keshavarz, 2016) and . In addition, because of the lack of a large number of observations, bootstrap resampling is employed for calculating standard deviation. Bootstrap is one of Monte Carlo's simulation methods,

<sup>1</sup> ATT: Average Treatment on the Treated

<sup>2</sup> PSM: Propensity Score Matching

which provides researchers with a re-sampling of the original sample and the estimation of the effect of the treatment of an empirical distribution of the desired statistics. In fact, the bootstrap process is similar to the Monte Carlo experiment, but it has a significant difference; in Monte Carlo studies, a random variable is extracted from a given distribution, such as a normal distribution, but in the bootstrap process, there is another approach, namely that random variables obtained from their empirical distribution function (EDF). Basically, the bootstrap method is based on the plug-in rule. According to this rule, the observed distribution of a random variable is the best estimate of its real distribution.

The idea of using this method was proposed by Efron (1979). Efron argued that the set of observed data is a random sample of  $T$  size derived from the real probability distribution of the data. In other words, the EDF is the best estimate of the actual distribution of data. Thus, the experimental function is defined as a discrete distribution in which the probability of occurrence of each observed value is  $\frac{1}{T}$ . Therefore, what makes the random variable is an EDF and not a predetermined distribution, such as a normal distribution. A self-processed sample is a random sample of  $T$  size obtained by inserting and placing the probability  $\frac{1}{T}$  for each observed value.

In general, matching is a method used to select the observations of the treatment group and the control group as well as to compare the effects of explanatory variables on the response variable (Zhao, 2004). This method is employed when the treatment and control groups are not randomly selected and other factors are involved in the allocation of the participants between the control and the treatment group. In this case, due to the use of the matching variables, it is called the random selection on observation. In the matching method, the propensity score that shows the probability of participation in a program is estimated, so that the explanatory variables in the multiple matching model are generated to adapt the effects between the two treatment and control groups. Accordingly, in the present paper, to evaluate the effect of product presentation on commodity exchanges on price fluctuations, a 33-case sample size is used; this sample covers 12 products traded on the commodities exchange and 21 off-exchange products. Moreover, the multiple matching method is employed. In the next section, the estimation results are presented.

## 5. Empirical Results

In the previous section, it was illustrated that participation in a program such as the supply of products on the commodities exchange can have a bearing on the implementation of that program. The created effect is the result of the program's execution. The exchange of goods on a commodities exchange can be accomplished with different goals. Depending on the type of the goals, for example, the reduction of price fluctuations, the realization of this outcome of this particular program occurs to some commodities. However, price

fluctuations for off-exchange commodities can also be achieved. What the effect is on prices and how other products react to price changes can be considered in the matching approach. Generally speaking, the formation of a commodities exchange and the supply of products in it can be done for different purposes. In addition, evaluation of its results can be conducted by the matching method.

In this section, the results obtained from the matching method developed by Abadie and Imbens (2002) are analyzed to assess the effect of entry of commodities on the commodities exchange on product prices. Based on this approach, the price response can be evaluated against entry on the commodities exchange.

Based on the matching approach, the growth of the prices of 33 commodities<sup>1,2</sup>, which are cross-sectional data in 2015, has been studied. The study model is explained as follows:

$$p_i = f(D_{EUj}, \text{energy cost}/\text{total cost}_i, \text{wage}/\text{total cost}_{i k_i}) \quad (9)$$

where,  $p_i$ : Price growth for commodity  $i$ ,  $D_{EU}$ : The dummy variable of the product trading on the commodities exchange (if the commodity is supplied in the commodities exchange, the value of this variable is one and otherwise it is zero).  $\text{wage}/\text{total cost}_i$ : the ratio of the cost of human resources to the costs for commodity  $i$ ,  $\text{energy cost}/\text{total cost}_i$ : Ratio of energy to the costs for commodity  $i$ , and  $j = 1, 2, \dots, 12$  (Supply on the commodities exchange), and  $i = 1, 2, \dots, 23$ .

Given that in the Iranian economy, most of the goods have an oligopoly or quasi-competitive market, the free market pricing model, based on the supply-demand equilibrium, cannot be a good reflective of the facts, because in this type of pricing, there is no opportunity for exercising personal power (Shakeri et al., 2015). One of the pricing methods in these non-competitive markets is the mark-up pricing method. In this method, the price of the product will be based on variable costs and add the markup rate as a profit on it. This rate may also indicate monopoly power (Taylor, 1991). Indeed, the mark-up is the difference between the cost and the selling price of a unit that is determined by the manufacturer to profit and without reducing the market share of the firm (Nekarda and Ramey, 2013). The reasons for the existence of mark-ups are important factors, one of the most important of which is the existence of the commodities warehouses and monopoly corporate structures. In general, in this pricing approach, the two indicators of total cost and mark-up value are important. Therefore, since in the pricing strategy based on the brand, the price is obtained via cost plus a percentage of the profit, the variables of the ratio of

<sup>1</sup> List of products that supply on the commodities exchange: steel, granular ore, zinc, aluminum, copper, bitumen, motor oil, vacuum balton, isoric acid, lobctate, sulfur, solvent.

<sup>2</sup> List of products that not supply on the commodities exchange: linear benzene alcohol, soap, lubricants, antifreeze, paraffin wax, manganese grains, power transformers, water heaters, radiators, cartons and Sheet, sugar from sugar beet, conveyor belt, raw coal, juice, cheese, chewing gum, chocolate, wafer, sodium sulfate powder, jelly water, tile and ceramic.

human resources costs and the ratio of energy to the total cost of the goods are added to the model as the matching variables.

It should be noted that since cost-based pricing strategy is cost-plus-percentage of profit, the variables of ratio of human resources costs and the ratio of energy to the total cost of the commodity are added as matching variables to the model.

In the matching approach employed in the present study, the variables of the model with the treatment variable that is the commodity entry on the commodities exchange is in the position of adapting the effect of this program on the response variable, namely, price fluctuations. According to the results, it can be concluded that entry on the commodities exchange has significant effects on the growth of commodity prices. In the following, the experimental results of multiple matching estimation by the method developed by Abadie and Imbens (2002) are presented, for the effect of moderate treatment, the effect of entry in the commodities exchange on the price is offered in conjunction with the Average Treatment on the Treated (ATT). In this regard, 33 commodities were used.

Since the aim of the present study is to investigate the effects of regulation of the commodities exchange on price growth, prices for the two categories of companies (those listing on the commodities exchange and those not), prices of 2011 to 2015 were considered and the growth of prices in this period was calculated. Therefore, the price growth has been calculated in this period. In addition, since the use of the method of Abad and Imbenz (2002) in multiple matching allow observable units to have more than one matching capability, and so the results are more accurate, in this study, two variables of the cost of human resources ratio and cost of energy ratio to the total cost are used as matching.

The descriptive statistics of the data used in this study is presented in the Table 1. First, we use the Probit regression to estimate the propensity score. The results reported in Table 2. Then, using the probability estimated via the matching of the propensity score and using the Caliper and Radius technique with a bandwidth as 0.1 of SD, the following results could be obtained and reported in Table 3. As Table 3 indicates, according to the treatment effect value (product supply on the commodities exchange) obtained between the supply and no supply of the product on the commodities exchange, which has a negative value as (-87.167) and significant value as (-3.196) at the probability level 5%, the product supply on the commodities exchange has reduced the price growth.

These results suggest that the supply on the commodities exchange, which was considered as an example of regulation in this study, has led to a drop in commodity prices. In other words, the entry and supply of commodities on the commodities exchange can control the speed of their price increase in the market.

**Table 1. Descriptive statistics**

Categories of Companies	Variables	Mean	Median	Max.	Min.	SDS
The 12 companies listed on the commodities exchanges	energy cost/total cost	5.50	0.50	30	0.14	9.47
	Price growth	36.69	32.10	155.23	-58.31	66.61
	wage/total cost	5.46	0.50	20.00	0.03	7.26
The 21 companies not listed on the commodities exchange	energy cost/total cost	4.7	1.5	26.3	0.3	7.2
	Price growth	105.5	99.7	186.2	13.5	39.4
	wage/total cost	9.6	7.6	23.2	0.8	7.0

**Table 2. Results of estimating the propensity score**

Variable	score	SD	t-statistic	p
energy cost/total cost	0.031704	0.0337995	0.94	0.348
wage/total cost	-0.065173	0.0369233	-1.77	0.078
C	-0.0623787	0.3467259	-0.18	0.857

**Table 3. Results of estimating of the matching of propensity score with the Caliper and Radius technique and Bootstrap SD**

Number of the treatment group	Number of the control group	ATT	Bootstrap SD	t-statistic
12	21	-87.167	27.273	-3.196

It is also necessary to consider, the balancing test of the characteristics of the companies in the treatment and control groups matching model. The aim of this test is to examine the hypothesis that the program is independent of the characteristics of the companies listed on the commodities exchange after observing their characteristics (Keshavarz, 2016). The results of balancing test are presented in Table 4.

**Table 4. Results of the balancing test**

Variables	Mean		Bias	t-test	
	Treatment group	Control group		t	p>t
energy cost/total cost	5.5027	1.3727	49	1.42	0.170
wage/total cost	5.4618	4.3455	15.6	0.38	0.707

Variables with a probability of statistical significance t bigger than 0.05 are well-matched and balanced. According to the results of Table 4, both variables selected as matching in this study are well-balanced.

## **6. Concluding Remarks**

This study focused on the significance of regulation in the Iranian financial sector to show that according to theoretical expectations, the implementation of financial regulation in the Iran Mercantile Exchange has played an important role in the process of gathering suppliers and demanders as well as the formation of the price of products. In the past century, regulation in different countries has been expanding in terms of both quantity and quality. For example, Jordana (2009) found that between 1990 and 2005, 15 to 35 new regulations were developed each year from 1990 to 2005, by reviewing the process of establishing regulatory agencies in 48 selected countries from 1920 to 2007 (88 years). However, the growth of the number of regulatory bodies before 1990 was far less than that. The growing number of regulatory agencies has introduced the new word “Governance of Regulators” into the literature of economics and governance. In other words, in addition to the necessity of establishing regulatory exchanges to achieve public benefit and prevent market failure, the need for the regulation and supervision is felt for the regulators themselves. For this purpose, after establishing a regulatory agency, the effectiveness of its regulation should be monitored and evaluated quantitatively. That is, each year, to examine the function of the regulators, various institutions (outside or inside the regulatory agency) evaluate the regulation effects of that agency before and after the application of any new regulation. However, with the creation and expansion of regulatory agencies in Iran, the lack of supervision over them, the study of the effects of their formation in general, and the effects of each of the rules imposed by them are clearly felt.

This study merely answers a specific question for evaluating the commodities exchange regulation effects: has commodities exchange regulation significantly affect commodity prices? If regulation influences the growth of prices, it can be concluded that commodities exchange regulation influences the process of trading these products. The results of this study indicate that listing the products on the commodities exchange has reduced the growth of the price of the products.

The advantage of commodities exchanges is the presence of regulatory bodies that all manufacturers and consumers face with organized rules. Regulation deficiencies in traditional markets point to a failure in the discovery process: pricing less and more than the product due to the inadequate formation of the relationship between suppliers and demanders (consumers), which by creating a transparent price discovery system, the need of a system supervising good execution of the obligations of the parties to the transaction will be resolved. The results of this study have shown that the creation of a market is influenced by an organized regulation system based on the price of products. Overall, a commodities exchange is an organized form of the market that can affect trading considerations and pricing. Setting up commodity exchanges by enforcing mandatory rules for all actors and providing an environment for better information access will affect the behavior of suppliers and demanders. Thus, in

this study, the data of two sets of products listed on the commodities exchange (12 products) and not listed on the commodities exchange (21 products) were collected. Then, they were divided into a treatment group (companies whose products are listed on commodities exchanges) and a control group (companies whose products have not been listed on the commodities exchange) were considered. Then using the matching method, the effect of regulating the stock exchange on the price of the products was considered. Moreover, variables of the ratio of energy to the total cost and the ratio of human resources costs to the total cost were used as a multiple matching. The effect of those variables are somehow controlled.

Significant difference in the price growth between the treatment and control groups showed that the market of the study products had problems. In addition, it indicated that this is regulatory behavior of the commodities exchange that has affected the price discovery process through interventions, such as increasing level of information and transparency, coping with corrupt exchanges and preventing price manipulation.

It should be noted that these results merely show the effects of commodities exchange regulation on market failures in markets without regulation. In order to complete the results of this study, it is necessary to test the efficiency of the market for each commodity listed or not listed on the commodity market by increasing the efficiency in case of listing on the commodities exchange.

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