

The effects of targeted subsidies on the prices of metal exchanging in the mercantile exchange

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Abstract: One of the important matters performed by the government was making subsidies targeted. After targeting subsidies, a rise in the domestic price of metals occurred. Hence, some believed in a cause and effect relationship between targeted subsidies and rising the domestic price of metals. Analyzing this issue, an econometric method to estimate the relationship between virtual variables of targeted subsidies and price of metals exchanging in the mercantile exchange has been used. In the beginning, the characteristics of the available time series has been analyzed for evaluating the model based on its reliability and considering whether a unique root exists based on Generalized Dickey Fuller Test. Then, according to the reliability of variables, for assessing the effectiveness of targeted subsidies, Auto Regression Model with Distributed Lags (ARDL) has been used. The results suggest that metal prices have not been affected by the targeted subsidies.

Key words: *Tehran mercantile exchange; Price of metals; International prices; Inflation; Exchange*

1. Introduction

One of the important matters that nearly all the domestic economists insist to be performed is targeted subsidies. In other words, there is no doubt regarding its necessity. Having a general study on the condition before implementing targeted subsidies, one will be aware that if Iran's economy moved in the same track, what would happen for its economy based on statistics and whether it was possible to maintain the economic growth rate within single digit. In 2010, the government decided to target subsidies; meanwhile the price of metals rose and made this belief that targeted subsidies cause such a rise. The present study attempts to illustrate whether targeted subsidies have a role on increasing of the price of metals or not.

Subsidies are one of the most important economic and political tools used by the government to support the vulnerable strata of the society and also certain productive sectors. In all economics, the welfare and social security has been of primary importance and part of the current governmental expenses is allocated, in the form of transferring payments to the vulnerable strata as a kind of protection. If the payment reaches the target groups, the government's aim will be satisfied properly and social security will be strengthened. Due to the economic necessity of targeted subsidies as a major surgery, if it does not run properly, the major parts of economy or at times whole the social economy will be hurt. Therefore, it seems necessary to do some researches on different parts of economy in order to use the outcome on the one hand and check

the feedback of the former operations and also to continue this massive surgical economic action.

The researchers tried to determine whether subsidies have an impact on prices of metals traded in the mercantile exchange or not. In fact, if the subsidies lead to higher prices in the following years after targeting or other factors had effects on the prices. Other factors that may have an impact on the prices of the metals include international prices, exchange rate, and index of prices and so on. Accordingly, the basis of the variables of the study is mentioned as;

1. The average price of mercantile exchange
2. The international price based on FOB Black Sea
3. The index of price
4. The average of exchange rate
5. Targeted subsidies

Hypothesis

Targeted subsidies have had an effect on the price of metals traded on the mercantile exchange.

2. Methods and procedures

To study the effect of targeted subsidies on the prices of metals traded on the mercantile exchange, it is necessary to use the economic method to estimate the relationship between virtual variable of targeted subsidies and prices of metals traded on the mercantile exchange. At first, the characteristics of the time series model is used to evaluate the reliability of the unit root test by means of generalized dickey fuller test. Then, based on the reliability of variables, Auto Regression Model with Distributed traps (ARDL) is used to assess the effectiveness of targeted subsidies and following that, the results of evaluating the model in use would be

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analyzed. In this study, all data like the monthly average price of metals traded on the mercantile exchange, international price, the index of the price, and the exchange rate both before and after targeted subsidies are used. Since all variables used in this study except for the virtual variable of targeted subsidies are non-static; there is a possibility of false OLS regression in estimating through ordinary Least Squares Method. Accordingly, in order to evade the false regression and achieving to the reliable results, the researcher uses the Auto Regression Model with distributed lag. This model not only considers the effect of independent variables on the dependent variable, but it also focuses on both the independent and the dependent variables with optimal pauses as the dependent variable in order to offer the best pattern.

When the sample size is small, using OLS to estimate the long-term relationship between variables will provide unbiased estimations because of neglecting short-term dynamic response. Banerjee Inder (1993) using Monte Carlo Simulation Method have shown that in the small samples, bias in estimations can be very significant. Stuck (1989) has demonstrated that the amount of bias that equated $\frac{1}{N}$, is very significant in the small samples (in which N is small). So, it is reasonable to estimate a whole which contains short-term dynamics. It results in estimating coefficient model with greater precision.

Noforsati (1999) proved that for obtaining co-integration vector with the least squares method, (ARDL)⁵ which elaborately explains lags can be used. In addition, the normal distribution of the least squares estimators would be biased in the small sample of more efficiency. Due to the limited time period of the sample, Harris (1995, 235) used Schwarz-Bayesian Criterion for determining the pattern of the optimal number of lag. Based on these criteria, the research model is generally expressed as below;

$$\begin{aligned}
 \text{Domestic Price}_t^i &= \alpha_0 + \sum_{j=1}^p \alpha_j \text{Domestic Price}_{t-j}^i \\
 &+ \sum_{j=0}^{q_1} \beta_{1j} \text{global Price}_{t-j}^i \\
 &+ \sum_{j=0}^{q_2} \beta_{2j} \text{CPI}_{t-j} + \sum_{j=0}^{q_3} \beta_{3j} \text{EXCHANG}_{t-j} \\
 &+ \sum_{j=0}^{q_4} \beta_{4j} \text{SUBSIDIES}_{t-j} + U_t
 \end{aligned}$$

In the above model, the dependent variables are the domestic prices of metals on the stock that are expressed as Domestic Price_tⁱ in the formula. It represents different metals and t refers to time. Independent variables includes $\sum_{j=1}^p \alpha_j \text{Domestic Price}_{t-j}^i$ Which shows the domestic prices of metal on the stock in the prior periods, $\sum_{j=0}^{q_1} \beta_{1j} \text{global Price}_{t-j}^i$ refers to the international prices of metals in the current and

prior periods, $\sum_{j=0}^{q_2} \beta_{2j} \text{CPI}_{t-j}$ refers to the mercantile and service rate in the present and prior period, $\sum_{j=0}^{q_3} \beta_{3j} \text{EXCHANG}_{t-j}$ refers to the exchange rate in the present and prior periods and finally $\sum_{j=0}^{q_4} \beta_{4j} \text{SUBSIDIES}_{t-j}$ is the impact of targeted subsidies in the present and prior periods. Since the main purpose of this study is analyzing the effect of targeted subsidies on the metals traded on the stock price, H_0 and H_1 are defined as below;

$$H_0 : \beta_{4j} = 0$$

$$H_1 : \beta_{4j} \neq 0$$

H_0 illustrates that the slope of the independent variable is not significantly different from zero and as a result the targeted subsidies may not change the dependent variable (the domestic price of metals). H_1 declares that the slope of the independent variable is significantly different from zero and consequently, targeted subsidies can change the dependent variable (the domestic prices). To prove or disprove the null hypothesis the t test statistic is used. If the error rate of the test is less than 5%, then the null hypothesis can be rejected at 5% error rate, and proves the relationship between targeted subsidies and the price of metals. If the error of statistic is greater than 5%, the null hypothesis can be rejected at 5% error rate, and the relationship between subsidies and metal prices are not verifiable.

In this study, the effect of targeted subsidies on the prices of metals such as copper, zinc, iron beam, cold rolled, hot rolled, bar, and aluminum are to be considered in Tehran Mercantile Exchange. It also focuses on the time period 2003 to the end of 2013.

2.1. Statistical Characteristics of the variables

Before estimating the model, the statistical characteristics of variables including mean, medium, maximum, standard deviation, skewness, and elongation were evaluated. A summary of the results is presented in Table1.

2.2. Reliability test

Using OLS estimation in the empirical works relies on the assumption that the variable of time series is reliable. On the other hand, it is often believed that many time series are not reliable in the economics. Therefore, it is necessary to ensure reliability or non-reliability of variables before using them (Noforsati, 1999). The unit root test is one of the most common tests used for recognizing reliability of a process of time series. In this research, generalized dickey fuller test (DF) without intercept is used for the unit root test and to determine the number of traps, Schwarz-Bayesian Criterion (SBC) is used. The results are summarized in the Table 1 below. If statistic of (DF) does not locate in critical area or the error level would be higher than 5%, then the null hypothesis regarding the existence of the unit root cannot be rejected and the series is not reliable.

Table 1: Statistical characteristics of variables

Statistical status Variables	mean	Medium	Maximum	Minimum	Standard deviation	Skewness	Elongation
Average price of exchanging aluminum bar	30892.58	26825	82268	12966	16106.87	1.43	4.09
Global price of aluminum bar	2115.524	2035.5	3116	1305	419.044	0.32	2.20
Average price of exchanging copper	84976.27	70838	238183.4	17490	57640.53	1.18	3.44
Global rice of copper	62775	7161	9804	1872	2121.693	-0.54	2.00
Index of price	77.38952	69.05	186.6	31	42.9291	1.13	3.35
Average price of cold rolled	8779.042	7067	19902	3822	4586.256	1.55	4.23
Global price of cold rolled	652.4032	632.5	1220	380	142.8499	1.33	6.26
Average of exchange rate	11784.79	9795	25381	8349	5293.659	1.99	5.16
Average price of exchanging bar	8085.992	6589.5	19910	2685	4531.901	1.15	3.17
Global price of bar	546.3085	550.25	1245	265	166.7518	1.78	8.29
Average price of exchanging hot rolled	7386.395	6387	16396	2702	3860.254	1.29	3.59
Global price of hot rolled	574.7339	555	1180	291	150.8971	1.57	7.44
Average price of exchanging iron bar	8225607	7146	25458.5	3117	4571.82	1.41	4.63
Global price of iron bar	625.1371	660	1035	280	150.562	0.18	3.78
Targeted subsidies	0.306452	0	1	0	0.46289	0.84	1.71
Average price of exchanging zinc	29180.97	25629	78000	8976	17790.95	1.20	3.64
Global price of zinc	2038.234	1944.5	4448	876	779.22	0.87	3.52

Table 2: unit root test-DF

Variables	Statistic of variable level test		Test statistic difference	
	The amount of statistic	Error level	Amount of statistic	Error level
Average of price exchange aluminum	-0.644897	0.8553	-8.464277	0.0000
global price of aluminum	-2.376895	0.1504	-8.471137	0.0000
average exchange price of copper	-0.737357	0.8324	-7.594765	0.0000
global price of copper	-2.441336	0.1327	-5.173597	0.0000
Index of price †	3.901834	1.0000	-2.306443	0.1716
average exchange price of cold rolled	0.206473	0.9720	-6.776533	0.0000
global price of exchange of cold rolled	-4.280170	0.0008	-	-
average exchange rate	-0.085140	0.9477	-11.37359	0.0000
average price exchange bar	-0.388096	0.9066	-9.821101	0.0000
global price of bar	-3.998492	0.0020	-	-
average exchange price of hot rolled	-0.217433	0.9320	-5.543296	
global price of exchange of hot rolled	-4.181666	0.0011	-	-
average exchange price of iron beam	-1.281252	0.6368	-18.25895	0.0000
global price of iron beam	-2.737541	0.0706	-8.275305	0.0000
Targeted subsidies	-0.659387	0.8519	-11.13553	0.0000
Average exchange price of zinc	-0.064379	0.9499	-9.972553	0.0000
Global price of zinc	-20.015806	0.2798	-9.145014	0.0000

1. Dickey-Fuller test and the generalized second-order difference of the variable error CPI respectively 18,303 / 10 and is 0000/0

2.3. Results of estimating model

The results of estimating the effective elements on the price of the metal traded on the exchange offer by the help of ARDL.

Table 3: estimating the effective elements on average price of aluminum in the exchange by using price exchange ARDL(2,2,1,2,0)

Independent variables	Slope	Standard deviation	statistic t	Degree of error
average price of aluminum bar of prior period	0.70937	.081663	8.6865	.000
average price of aluminum bar of two prior period	.17326	.079630	2.1758	.032
global price of aluminum bar	5.4718	1.3040	4.1962	.000
global price of aluminum bar of prior period	-.35815	2.0392	-.1756	.861
global price of aluminum bar of two prior period	-4.4020	1.3503	-3.260	.001
index of price	554.0080	189.8000	2.9189	.004
index of price of prior period	-522.2602	188.7100	-2.767	.007
average exchange rate	1.7299	.1400	11.688	.000
average exchange rate of prior period	-.72512	.21918	-3.308	.001
average exchange rate of two prior period	-1.0956	.20474	-5.351	.000
targeted subsidies	386.3291	688.9626	.56074	.576
statistic R ²	.98987	statistic R ² adjusted	0.98898	
regression standard deviation	1712.8	F statistic F(10, 113)	11046	0.000
total square hysteresis model	3.3208	logarithm of the maximum likelihood index	-1093.5	
Akaike index	-1104.5	Schwarz-Bayesian Criterion	-1120	
Durbin's h-statistic	1.5248			

According to Table 3, the exchange price of aluminum bar is influenced by the exchange price of aluminum bar in the prior period and two prior periods, the global price of aluminum bar in the present period and two prior periods, the index of price in the present period and two prior periods,

the exchange rate in the present period, the prior period and two prior periods. Moreover, according to the information offered in Table 3, targeted subsidies have not had a significant effect on the exchange price of aluminum bar.

Table 4: estimating the effective elements on the average price of copper on the exchange by using ARDL (2,1,0,1,0)

independent variables	slope	standard deviation	statistic t	degree of error
exchange price of copper of prior period	1.1081	.039034	28.387	.000
exchange price of copper of two prior period	-1.4535	.038859	-3.740	.000
global price of copper	9.1735	.59822	15.334	.000
global price of copper of prior period	-8.9263	.60579	-14.73	.000
index of price	71.9867	24.3741	2.9534	.004
exchange rate	4.1957	.26577	15.786	.000
exchange rate of prior period	-4.5728	.26692	-17.13	.000
targeted subsidies	1862.4	1329.1	1.4012	.164
statistic R ²	.99712	statistic R ² adjusted	0.9969	.000
regression standard deviation	3237.7	F statistic F(7, 116)	5736.1	
total square hysteresis model	1.21E+09	logarithm of the maximum likelihood index	-1173.7	
Akaike index	-1181.7	Schwarz-Bayesian Criterion	-1193	
Durbin's h-statistic	1.6342			

According to Table 4, the exchange price of copper is affected by the exchange price of copper in the prior period and two prior periods, the global price of copper in the present period and two prior periods, the index of price in the present period and two prior periods. Therefore, based on Table 4,

targeted subsidies have not had a significant effect on the exchange price of copper.

Information considered in Table 5 demonstrates that the exchange price of cold rolled is affected by the exchange price of cold rolled in the prior period, the global price of cold rolled based on based on FOB of Black Sea in the present period, prior period and

two prior periods, the index of price in the present period and the prior period, the exchange rate in the present period and two prior periods. Furthermore,

according to Table 5, targeted subsidies have not had a significant effect on the exchange price of cold rolled.

Table 5: estimating the effective elements on the average price of cold rolled on the exchange by using ARDL (1,2,1,2,0)

Dependent variable	slope	Standard deviation	statistic t	Degree of error
exchange price of cold rolled of prior period	.05944	.035978	26.667	.000
global price of cold rolled	2.4352	.66312	3.6723	.000
global price of cold rolled of prior period	.0064106	1.0818	.00592	.995
global price of cold rolled of two prior period	-2.3373	.63620	-3.673	.000
index of price	90.4235	36.6620	2.4664	.015
index of price of prior period	-87.9672	35.9692	-2.445	.016
exchange rate	.14333	.028871	4.9645	.000
exchange rate of prior period	-.024366	.36412	-.6691	.505
exchange rate of two prior period	-.11437	.029422	-3.887	.000
targeted subsidies	61.7393	135.0109	.05729	.648
statistic R ²	.99505	statistic R ² adjusted	0.99466	
regression standard deviation	338.7834	F statistic F(9, 114)	25486	.000
total square hysteresis model	1.31E+07	logarithm of the maximum likelihood index	-893.08	
Akaike index	-903.0800	Schwarz-Bayesian Criterion	-917.17	
Durbin's h-statistic	1.7929	Durbin's h-statistic	2587	.208

Table 6: estimating the effective elements on the average price of bar on the exchange by using ARDL(1,2,1,0,0)

independent variables	slope	standard deviation	statistic t	degree of error
exchange price of bar of prior period	.82671	.048979	16.878	.000
global price of bar	2.1996	1.37552	1.5996	.112
global price of bar of prior period	2.0809	2.4305	.85615	.394
global price of bar of two prior period	-3.6980	1.3804	-2.679	.008
index of price	327.6763	71.4774	4.5843	.000
index of price of prior period	-314.5855	69.4952	-4.526	.000
exchange rate	-.018425	.028940	-.6366	.526
targeted subsidies	-51.4662	263.9741	-1.949	.846
statistic R ²	.98034	statistic R ² adjusted	0.9791	
regression standard deviation	661.8779	F statistic F(7, 116)	6.2926	.000
total square hysteresis model	5.08E+07	logarithm of the maximum likelihood index	-977.20	
Akaike index	-985.2036	Schwarz-Bayesian Criterion	-99604	
Durbin's h-statistic	1.9893	Durbin's h-statistic	.71117	.943

According to the information presented in Table 6, the exchange price of bar is affected by the exchange price of bar in the prior period, the global price of bar based on FOB of Black Sea in two prior

periods, the index of price in the present period and two prior periods. Then, based on information presented in Table 6, targeted subsidies have not had a significant effect on the exchange price of bar.

Table7: estimating the effective elements on the average price of hot rolled on the exchange ARDL (1,2,0,2,0)

independent variables	slope	standard deviation	statistic t	degree of error
price hot rolled of prior period	.90733	.037730	24.047	.000
global price of hot rolled	2.0803	.82640	2.5173	.013
global price of hot rolled of prior period	.64723	1.4428	.04485	.964
global price of hot rolled of two prior period	-2.0497	.83390	-2.457	.015
index of price	4.2058	3.4967	1.2028	.232
exchange rate	.093231	.033505	2.7826	.006
exchange rate of prior period	.35998	.044919	.80139	.425
exchange rate of two prior period	-10253	.033947	-3.020	.003
targeted subsidies	190.1988	159.6339	1.1915	.236
statistic R ²	.098899	statistic R ² adjusted	0.9882	
regression standard deviation	421.7165	F statistic F(8, 115)	1291.8	.000
total square hysteresis model	2.05E+07	logarithm of the maximum likelihood index	-920.774	
Akaike index	-929.7740	Schwarz-Bayesian Criterion	-942.465	
Durbin's h-statistic	2.0080	Durbin's h-statistic	-4.9008	

Table 7 elaborates on the exchange price of hot rolled which is under the influence of the exchange price of hot rolled in the prior period, the global price of hot rolled based on FOB of Black Sea in the present period and two prior periods, the exchange

rate of the present period and two prior periods. Therefore, according to the information presented in Table 7, targeted subsidies have not had a significant influence on the exchange price of hot rolled.

Table8: estimating the effective elements on the average price of iron beam on the exchange by using ARDL (2,2,1,0,0)

Independent variables	slope	Standard deviation	statistic t	Degree of error
exchange price iron beam of prior period	.30650	.81202	3.7745	.000
exchange price of iron beam two of prior period	.50767	.080379	6.3160	.000
global price iron beam	4.7206	2.2590	2.0897	.039
global price iron beam of prior period	2.8039	3.6370	.77093	.442
global price iron beam two of prior period	-6.8950	2.3217	-2.969	.004
Index of price	283.7579	95.8876	2.9593	.004
Exchange rate of prior period	-277.9334	93.6751	-2.967	.004
Exchange rate	.030489	.40928	.74494	.458
Targeted subsidies	381.2600	407.9993	.93446	.352
statistic R ²	.95923	statistic R ² adjusted	0.95639	
regression standard deviation	958.9.77	F statistic F(8, 115)	8.2000	.000
total square hysteresis model	1.06E+08	logarithm of the maximum likelihood index	-1022.6	
Akaike index	-1031.6	Schwarz-Bayesian Criterion	-1044.3	
Durbin's h-statistic	2.1089			

Table9: estimating the effective elements on the average price of zing on the exchange by using ARDL (2,2,1,2,0)

Independent variables	slope	Standard deviation	statistic t	Degree of error
exchange price of zinc of prior period	.72655	.86046	8.4438	.000
exchange price of zinc two of prior period	.22.29	.084840	2.5965	.011
global price of zinc	7.4270	1.0663	6.9652	.000
global price of zinc of prior period	-3.5633	1.7370	-2.051	.043
global price of zinc of two prior period	-3.5230	1.2273	-2.870	.005
index of price	643.0259	229.0820	2.8070	.006
index of price of prior period	-644.1068	227.9058	-2.826	.006
exchange rate	.83421	.18607	4.4833	.000
exchange rate of prior period	-.09667	.24364	-.3721	.710
exchange rate two of prior period	-.72284	.19842	-3.643	.000
targeted subsidies	660.4521	868.8445	.76015	.449
statistic R ²	098637	statistic R ² adjusted	0.98516	
regression standard deviation	2180.0	F statistic F(10, 113)	7.4580	.000
total square hysteresis model	5.37E+08	logarithm of the maximum likelihood index	-1123.4	
Akaike index	-1134.4	Schwarz-Bayesian Criterion	-1149.9	
Durbin's h-statistic				

Information offered in Table 8 exposes that the exchange price of iron beam has been influenced by the exchange price of iron beam in the prior period and two prior periods, the global price of iron beam based on FOB of Black Sea, the index of price in the present period and prior period. So, according to the information presented in Table 8, targeted subsidies have not had a significant effect on the exchange price of iron beam.

According to Table 9, the exchange price of zinc has been affected by the exchange price of zinc in the

prior period and two prior periods, the global price of zinc in the present period, prior period and two prior periods, the exchange rate in the present period and two prior periods. Therefore, based on the information presented in Table 9, targeted subsidies have not had a significant effect on the exchange price of zinc.

3. Conclusion

Since the significant elements on the price of 7 kinds of metal have been analyzed in this study, to

achieve a better understanding, all the results have been summarized in the Table 10.

Table 10: The summary of estimating the effective results on the price of metals by using ARDL

Zinc	iron beam	Hot rolled	Bar	Cold rolled	Copper	Aluminum	Dependent variable Independent variable
significant	Domestic price of two prior periods						
significant	Significant				Significant	Significant	Domestic price of present period
significant	Significant	Significant	insignificant	Significant	Significant	Significant	Present global price
significant	Insignificant	Insignificant	insignificant	Insignificant	Significant	Insignificant	global price of two prior periods
significant	Significant	Significant	Significant	Significant		Significant	global price of two prior periods
significant	Significant	Insignificant	Significant	Significant	Significant	Significant	index of price of present period
significant	Significant		significant	Significant		Significant	index of price of prior period
							index of price of two prior period
significant	Insignificant	Significant	insignificant	Significant	Significant	Significant	exchange rate of present period
insignificant		Insignificant		Insignificant	Significant	Significant	exchange rate of two prior periods
significant		Significant		Significant		Significant	exchange rate of two prior periods
insignificant	Virtual variable of targeted subsidies						

According to the information in Table 10, the variable of the domestic price of metals in the prior period in all kinds of metal under investigation has had a significant effect on the prices of metals in the present period. In the metals like aluminum, copper, iron beam, and zinc, the domestic price of two prior periods of each metal has had a significant influence on the price of that particular metal. The change in the global price of the present period has change the prices of all mentioned metals except for bar.

The global price of the prior period of two metals, i.e. copper and zinc has had a significant influence on their present price. The global price of two prior periods of all metals except copper has had a significant effect on the price of those particular metals. The index of price in the present period of all mentioned metals has had a significant effect on their domestic price except for hot rolled. The index of price of the prior period has also had a significant effect on their domestic price except for the copper and hot rolled. The index of the price of two prior periods has not had an effect on none of the mentioned metals. The exchange rate of the present period in all the metals except for bar and iron beam has had a significant effect on their present price and the exchange rate of the prior period has had a significant impact on the present price only in these two kinds of metal, i.e. aluminum and copper. The exchange rate in two prior periods in 4 kinds of metal, i.e. aluminum, cold rolled, hot rolled and zinc had had a significant effect on their present price. The outstanding and influential point is that targeted subsidies have not had a significant effect on the prices of the mentioned metals.

Based on the above results, this question arises that what is the reason for increasing the price of metals after targeted subsidies? In this study, in addition to the targeted subsidies, other variables like the exchange rate, the general level of prices, and the global prices have been analyzed. It proved that the increase in the domestic prices can be influenced by these factors. Though, for considering the exact influence, each variable can be analyzed in separate survey. For instance, the inflation rate can be influenced by different elements like the exchange rate, the policies of Central Bank, the psychological elements, sanctions, and so on.

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