

Analysis of Behavior Relationship Between Exchange Rate (USD / IDR), Interest Rate, Inflation, Growth of GDP and Indonesian Composite Index (IHSG) in Indonesia Stock Exchange Period 2008-2018

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Abstract

This research aims to determine empirically the relationship between exchange rate (USD/IDR), interest rate, inflation and growth gross domestic product with Indonesian Composite Index in the Indonesia Stock Exchange. This research uses data from the official website of Bank Indonesia and Yahoo! Finance in 2008-2018. The analysis technique using VECM method. This research using analysis program Eviews 9. Before the test, data is transformed into natural logarithms.

Keywords: Exchange Rate, Interest Rate, Inflation, Gross Domestic Product, IHSG, Composite Index, VAR, VECM, Macroeconomic Variables, Eviews, Correlation.

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INTRODUCTION

RESEARCH BACKGROUND

In a country's economic development, it is not too excessive to say that the development of the capital market and securities industry is a benchmark and supporting factor for the country's economic growth. According to Darmaji and Fakhruddi [1] states that the Capital Market is a place for trading of various long-term financial instruments such as debt, equity (stocks), derivative instruments, and other instruments.

The capital market has an important role for the economy of a country because the capital market as a

place and means for business funding and for companies to get funds from the public investors (investors). The funds obtained from the capital market can be used to expand businesses, improve capital structure and to carry out the transfer of shareholders and others.

From empirical data from 2008 to 2018, it can be seen that the Composite Stock Price Index (CSPI) has experienced an increase continuously even though in 2013 there was a decline that can be seen in Figure-1 below:

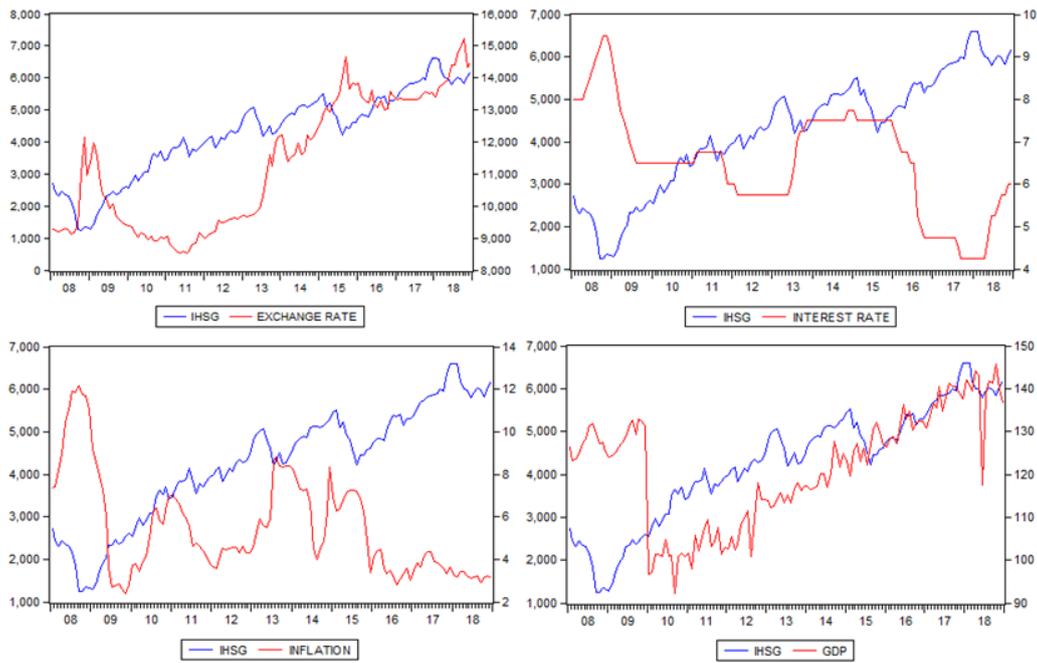


Fig-1: All variables movement over 11 years
Source: Yahoo! Finance

Looking at Figure-1 above, it can be concluded that the IHSX, exchange rate (Rp/USD), interest rate, inflation, growth of gross domestic product in the last 11 years or in the period 2008-2018 experienced a fairly dynamic development each year.

LITERATURE REVIEW AND THEORITIRICAL FRAMEWORK

Keynes' Revolution: The Birth of Macroeconomic Theory

Before the global economic downturn in 1929-1933, known as the Great Depression, economists believed in market mechanisms, but the Great Depression dissolved confidence in the Classical Economic hypothesis, because the Great Depression occurred for a long time (1929-1933) and caused big problems.

John Maynard Keynes, expressed his opinion to improve the situation through his book *The General Theory of Employment, Interest and Money*, published in 1936. In his book, better known as *The General Theory*, according to Keynes, the weakness of the Classical Theory is the weak assumptions about markets that are considered too idealistic (utopian) and too emphasized economic problems on the supply side. In connection with this criticism, Keynes expressed the second point of view in the form of a recovery proposal by including the role of government in the economy in order to stimulate the demand side.

Macroeconomic Theory

The development of modern economics began when Adam Smith (1723-1790) published his book *An Inquiry into the Nature and Causes of the Wealth of Nations*, which came to be known as *Wealth of Nations*

1776. Adam Smith states that like the universe that runs in an orderly manner, the economic system will be able to restore itself (adjustment), because there are regulatory forces called the invisible hands.

Confidence in the ability of market mechanisms became stronger when a French economist, Jean Baptiste Say 1767-1832, matured Smith's thoughts by making an opinion now known as Say's law "... supply creates its own demand ..." in his book: *A Treatise on Political Economy* 1803. The purpose of the statement is that the goods and services produced must be absorbed by demand until market balance is achieved.

Relationship between Stocks and Exchange Rates

According to Dornbusch [2] in Syakhroza [3] there are generally 2 approaches to seeing the relationship of exchange rates and stock prices, namely: the conventional approach (traditional approach) and the portfolio approach (portfolio approach). From a macroeconomic perspective, changes in exchange rates will cause changes in the portfolio value of multinational companies. Appreciation of the domestic exchange rate will cause a decline in corporate profits, in this case the share price. While the traditional approach states that the appreciation of the domestic currency in a flexible exchange rate will cause a reduction in the competitiveness of a country's product, and will reduce its share price. From these two views exchange rate movements are seen as leading from exchange rate movements.

Keynesian Classical Interest Rate Theory

Moving on from microeconomic theory, classical theory says that the interest rate is the value of remuneration from capital. In classical theory, the stock

of capital goods is mixed with money and both are considered to have a substitutionary relationship. The more scarce the capital, the higher the interest rate. Conversely, the more capital the lower the interest rate [4].

The lower the interest rates, the more motivated entrepreneurs will be to invest, because the cost of using funds is also getting smaller [5].

Inflation Theory (Keynesian)

Quantity Theory

In Atmadja [6] this theory is the oldest theory that discusses inflation, but in its development this theory has been perfected by economists at the University of Chicago, so this theory is also known as a monetarist model:

1. Inflation can only occur if there is an increase in the volume of money supply, both currency and demand deposits.
2. The rate of inflation is also determined by the rate of increase in the money supply and by the expectations (expectations) of the public regarding future price increases.

Keynesian Models Theory

With the state of purchasing power between groups that exist in the community is not the same (heterogenous), then there will then be a reallocation of goods available from groups of people who have relatively low purchasing power to groups of people who have greater purchasing power. This incident will continue to occur in the community. Thus, the inflation rate will stop only if one group of people can no longer obtain funds (no longer have purchasing power) to finance the purchase of goods at the prevailing price level, so that the effective demand of society as a whole no longer exceeds the supply of goods (inflationary gap disappears) [6].

Structural Theory: Inflation Models in Developing Countries

According to the conclusions of the study Dalal M. N. and G. Schachter [7], if the contribution of imports to the formation of domestic output is very large, which means the nature of imported goods is very important to the price behavior in the importing country, then the increase in the price of imported goods will cause considerable domestic inflationary pressure. In addition, the lower the degree of competition held by imported goods (price inelastic) on domestic products, the greater the impact of changes in prices of imported goods on domestic inflation.

Arbitrage Pricing Theory

Arbitrage Pricing Theory basically uses the idea that two investment opportunities that have the same identical characteristics cannot be sold at different prices. The concept used is the law of one price (the law of one price). If the assets with the same characteristics are sold at different prices, then there will be an opportunity to arbitrate by buying low-priced assets and at the same time selling them at a higher price so as to obtain profits without risk [8].

METHODOLOGY

This research aims to find whether there is a reciprocal relationship between the exchange rate (USD / IDR), SBI interest rates, inflation, and GDP growth with IHSG on the Indonesia Stock Exchange in the period 2008-2018. The analytical method used in this study is the VAR (Vector Autoregression) method which is likely to be continued with the VECM (Vector Error Correction Model) method. The use of VAR equations makes it easy to solve problems in the economy because of their ability to describe data, forecasting, structural infra- structure, and policy analysis [9].

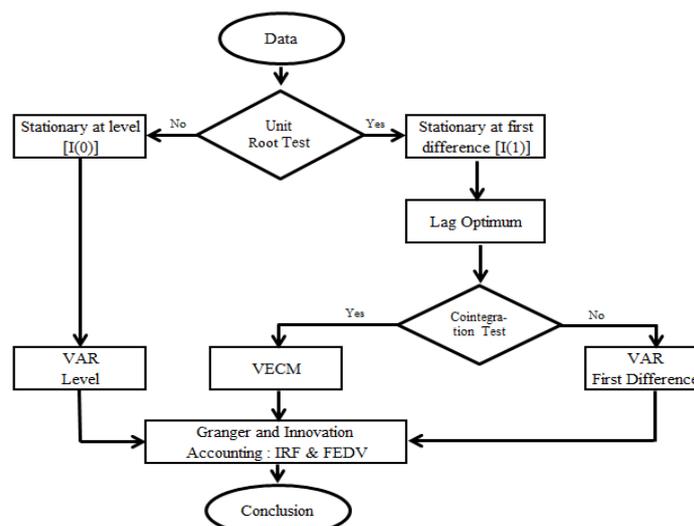


Fig-2: VAR / VECM Data Analysis Chart
 Source: Ascraya et al., in Slamet [10]

This VAR model was first developed by Sims [11] which later became the basis for the emergence of Johansen's cointegration method [12, 9]. The VAR model can be systematically represented by:

$$Z_t = \sum_{i=0}^n A_i Z_{t-1} + BX_t + \epsilon_t$$

Where Z_t is a vector of variables explained as many as n , X_t is a vector of variables that explain as many as n including the constant (intercept). A_1, \dots, A_n and B are the coefficient matrices to be estimated, and ϵ_t is a vector of residuals. Z_{t-1} is a vector of exogenous variables in the previous period.

VECM is a form of terrestricted VAR. Restrictions are given because the data is not stationary but cointegrated. VECM utilizes the cointegression restriction in its model specifications. Therefore, VECM is often referred to as a VAR system for non-stationary series that has a cointegration relationship [13]. The VECM specification restricts the long-term relationship of endogenous variables so that they converge into their cointegration relationships, while still allowing the existence of dynamic short-term data.

RESULT

Unit Root Test (ADF Test)

Variables	Stasionery Level					
	Level			First Difference		
	t-statistic	Prob.	Description	t-statistic	Prob.	Description
IHSG	-1.9360	0.6300	Not stationary	-8.5051*	0.0000	Stasioner
EXC	-1.8457	0.6767	Not stationary	-10.4006*	0.0000	Stasioner
IR	-2.3053	0.4278	Not stationary	-6.8397**	0.0000	Stasioner
INF	-2.9158	0.1610	Not stationary	-7.9154**	0.0000	Stasioner
GDP	-3.0383	0.1260	Not stationary	-10.8000*	0.0000	Stasioner

Source : Data processing results

Description :

- *: > McKinnon's critical value at $\alpha = 1\%$
- ** : > McKinnon's critical value at $\alpha = 5\%$
- *** : > McKinnon's critical value at $\alpha = 10\%$

Fig-3: Augmented Dickey Fuller Test Result

Unit root test results as shown in Fig-3 show that all variables will be estimated at the level namely; IHSG, exchange rate and GDP are not stationary. All variables are declared not stationary at the level because it has an Augmented Dicky-Fuller statistical value that is greater than the critical value of Mac Kinnon's. Then

after the first difference process, all variables are stationary with various criteria of Mac Kinnon's degree of confidence (1% and 5%). Which means that all variables no longer contain unit and stationary roots at the first difference level.

Lag Optimum Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1000.835	NA	6.39E-14	-16.19244	-16.07812	-16.146
1	1077.15	145.1839	2.77E-14	-17.07682	-16.34092*	-16.74821*
2	1105.048	50.80714	2.65e-14*	-16.07395*	-15.81647	-16.56317
3	1114.428	16.31879	3.44E-14	-16.81996	-14.9909	-16.077
4	1134.091	32.61288	3.78E-14	-16.73319	-14.33255	-15.75806
5	1146.03	18.82981	4.75E-14	-16.52081	-13.54858	-15.3135
6	1169.251	34.73691	5.00E-14	-16.49188	-12.94807	-15.05239

Source : Data processing result

Fig-4: Lag Optimum Test Result

Determination of the optimal lag can use the information provided by the Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ) [14]. Based on seeing the AIC value of SIC funds to determine the optimal lag, it is

seen that with the recommended optimal AIC log criteria is lag 2 because it is based on the smallest lag value. Then the optimum lag test results in Fig-4 show that almost all the asterisks are in lag 2. Then, lag 2 is chosen as the optimum lag and is used at all subsequent stages of VAR analysis.

VAR Stability Test

To test whether or not the estimated VAR has been determined is stable, a VAR condition stability check is performed in the form of roots of characteristic polynomial. A VAR model is said to be stable if all its roots have modulus that is smaller than 1 (one). Then after testing, it is known that there is no characteristic root value of more than 1 (one).

Causality Granger Test

Causality test is a test to determine the causal relationship between variables in a VAR system. Kasuality relationship can be tested using the Granger

causality test. After testing, there are no variables that have a 2-way relationship, but there is only one direction, namely: between the IHSG with the exchange rate, IHSG with interest rates, interest rates with exchange rates, and also inflation with interest rates.

Cointegration Test

The conclusion drawn is based on a comparison between the Trace Statistics value with a critical value at alpha 0.05, and by looking at the probability value to show whether there is an equation in a cointegrated system.

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.7049	447.3571	69.8189	0.0001
At most 1 *	0.6266	288.6950	47.8561	0.0001
At most 2 *	0.4226	160.6270	29.7971	0.0001
At most 3 *	0.3575	89.2212	15.4947	0.0000
At most 4 *	0.2165	31.7116	3.84147	0.0000

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.7049	158.6621	33.8769	0.0001
At most 1 *	0.6266	128.0679	27.5843	0.0000
At most 2 *	0.4226	71.4058	21.1316	0.0000
At most 3 *	0.3575	57.5096	14.2646	0.0000
At most 4 *	0.2165	31.7116	3.84147	0.0000

Source : Data processing result

Fig-5: Cointegration Test Result

The results of the cointegration test in Fig. 5 show the value of the Trace Statistics from the Tracer test of 447.3571 is greater than the critical value of alpha 0.05 of 68.8189 which means that in the system there is one cointegrated equation. Then it is known that there are Trace Statistics values of 288,695, 160,627, 89.2212, and 31.7116 which are greater than alpha critical values 0.05 with values of 47.85613, 29.79707, 15.49471 and 3.841466 which can be concluded that there are at least 4 integrated equations. Then from the Maximum Eigenvalue test, the value of the Trace Statistics of 158.6621 is greater than the critical value of alpha 0.05 of 33.8768 which means that in the system there is one cointegrated equation. Then it is known that there are Trace Statistics values of 128.0679, 71.4058, 57.5096 and 31.7116 which are greater than alpha critical values 0.05 with values of

27.5843, 21.1316, 14.2646, and 3.8414 which can be concluded that there are at least 4 cointegrated equations.

VECM Estimation

According to Ajija *et al.*, in Putri [15] Vector Error Correction Model (VECM) is an econometric analysis model that can be used to determine the short-term behavior of a variable against its long-term, due to permanent shock. In the VECM method to see whether there is a long-term or short-term relationship can be seen by paying attention to the comparison of the estimated t-statistics from the t-table. If the t-statistic is greater than the t-table value, then it can be concluded that there is a long-term or short-term relationship. The existence of long or short term relationships shows that the independent variable influences the dependent [15].

		LONG TERM				
VARIABLE		IHSG	EXC	RATE	INF	GDP
		AS DEPENDENT VARIABLES (Y)				
INDEPENDENT VARIABLE (X) IN LAG 2	IHSG	-	-	7.870741	-9.974033	-4.974679
	EXC	2.858077	0.349886	22.49518	-28.50655	-14.21802
	RATE	-	-	-	-	-0.632047
	INF	-0.10026	-0.03508	-0.789123	-	-0.498763
	GDP	-	-	-	-	-
		SHORT TERM				
VARIABLE		IHSG	EXC	RATE	INF	GDP
		AS DEPENDENT VARIABLES (Y)				
INDEPENDENT VARIABLE (X) IN LAG 2	IHSG	-	0.117629	-	-	-
	EXC	0.719309	0.117412	-	-	-
	RATE	-	-	-0.408903	-	-
	INF	-	-0.050788	-	-0.202597	-
	GDP	-	-	-	-	-0.537653

Fig-6: VECM Estimation Result

The IHSG on the Indonesia Stock Exchange has a reciprocal relationship with the exchange rate in 2008 - 2018, namely in the analysis of short-term relationships with a probability value of 0.719309 for the IHSG with the exchange rate and a probability value of 0.117629 for the exchange rate with the IHSG, this is indicated by the results of the VECM estimation. If the IHSG rises by 1%, the exchange rate will respond by rising by 0.719309%, and conversely if the exchange rate rises by 1%, the IHSG will rise by 0.117629%. Then in the long run IHSG also has a relationship with the exchange rate with a probability value of 2.858077 for the IHSG with an exchange rate and a probability value of 0.349886 for the exchange rate with this case indicated by the estimated VECM. If the IHSG rises by 1%, the exchange rate will respond by increasing by 2.858077%, and vice versa if the exchange rate rises by 1%, the IHSG will rise by 0.349886%.

The IHSG on the Indonesia Stock Exchange has a reciprocal relationship with interest rates in 2008 - 2018. This is indicated by the results of the VECM estimation in Fig. 6, only in the long run interest rate has a one-way relationship with a probability value of 7.870741. In other words, if interest rate rises 1%, the JCI will increase by 7.870741%.

The IHSG on the Indonesia Stock Exchange has a negative reciprocal relationship with inflation in 2008 - 2018, namely in the analysis of a long-term relationship with a probability value of -0.10026 for IHSG with inflation and a probability value of -9.97403 for inflation with IHSG, this in the VECM estimation results. If the IHSG rises by 1%, inflation will respond by falling by -0.10026%, and conversely if inflation rises by 1%, the IHSG will decrease by -9.97403%. In the short term, according to the results of the study, these two variables do not have a two-way or one-way reciprocal relationship.

The IHSG on the Indonesia Stock Exchange did not have a reciprocal relationship with GDP in 2008 - 2018. During this period, these two variables only had a long-term relationship with a probability value of -4,974679. If GDP rises by 1%, the IHSG will respond by decreasing by -4,974679%. GDP variable which has the opposite test results with the existing theory, where the VECM test results where a decrease of -14.21802%.

The exchange rate does not have a reciprocal relationship with interest rate in 2008 - 2018. During this period, these two variables only had a one-way relationship in the long run, with a probability value of 22.49518. If interest rate rises 1%, the exchange rate will respond with an increase of 22.49518%.

The exchange rate has a negative reciprocal relationship with inflation in 2008-2018, namely in the analysis of long-term relationships with a probability value of -0.03508 for the exchange rate with inflation and a probability value of -28.50655 for inflation with the exchange rate, this in the VECM estimation results. If the exchange rate rises by 1% then inflation will respond by falling by -0.03508%, and conversely if inflation rises by 1% then the exchange rate will decrease by -28.50655%.

The exchange rate has no reciprocal relationship with gross domestic product. This is indicated by the results of the research in Fig-6 that the researchers have summarized. It can be seen that the exchange rate does not have a short or long term relationship with GDP, however only GDP has a long term relationship with a probability value of -14.21802. Which if GDP increases by 1%, the exchange rate will respond by decreasing by -14.21802%.

From Fig-6, it can be seen that interest rate has only one relationship with inflation in the long run with a probability value of -0.789123. If the interest rate rises

by 1% then inflation will respond with a decrease of -0.789123%.

From Fig-6, it can be seen that interest rate has only one relationship with GDP in the long run with a probability value of -0.632047. If the SBI rises by 1%, GDP will respond with a decrease of -0.632047%.

Impulse Respons Function

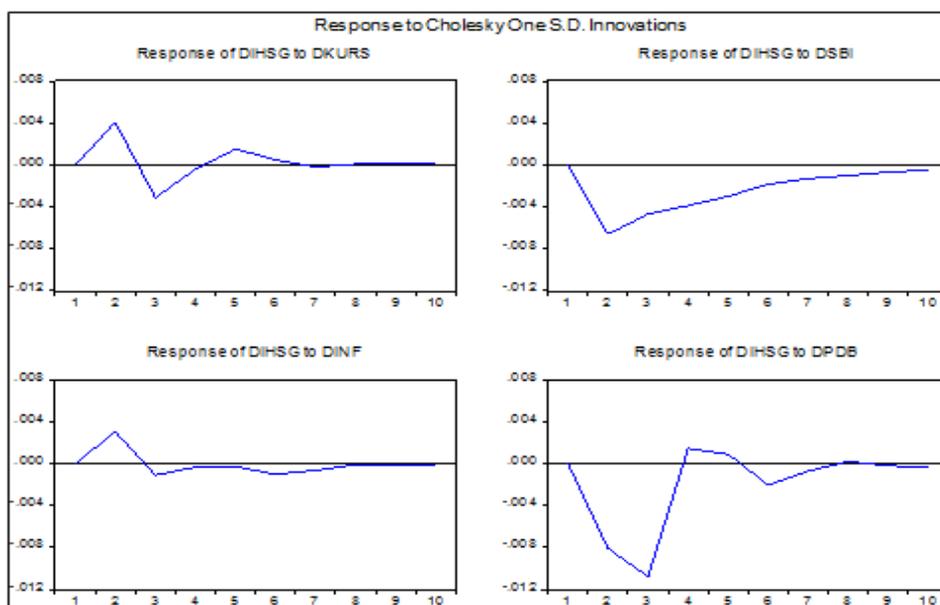


Fig-7: Impulse Respon Function

From the analysis of the impulse response function on all variables to shocks given from IHSG volatility, it appears that the variable rate most quickly reached to the current instability shocks in the form of a variable response IHSG stably positive value in 10 period will be waiting. It is concluded that the variable rate affected the most stable compared with other variables when it gets a shock from IHSG.

CONCLUSION & RECOMMENDATION

CONCLUSION

Only IHSG with the exchange rate, IHSG with inflation, and the exchange rate with inflation having mutual relations in 2008-2018.

RECOMMENDATION

Based on the conclusions outlined above, the following suggestions can be given by the author:

- For further researchers, so that the factors studied by the author, such as the exchange rate, interest rate, inflation, and GDP, there are still many other factors that can be developed and have a greater or more dominant influence on the IHSG.
- For investors, they can pay attention to the exchange rate, interest rate, inflation, and GDP as one of the basic references in making decisions in investing in the capital market, as well as many

From Fig-6, it can be seen that inflation has only one relationship with GDP in the long run with a probability value of -0.498763. If SBI rises by 1%, GDP will respond with a decrease of -0.498763%.

other factors that influence the ups and downs of stock prices.

- For the government, advancing the Indonesian capital market again must be in a more conducive economic, political and legal environment for the business world, especially the capital market. Because the investment climate is less conducive, the rules that make it difficult and the weak legal certainty that will make investors who invest their capital in our country can run to other countries and find capital markets that are more prospective, conducive and provide better returns than us.

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